Feasibility Study

Spaulding Turnpike Improvements

Newington – Dover, 11238
New Hampshire

Prepared for **New Hampshire Department of Transportation**
Concord, New Hampshire

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Executive Summary

Senate Bill 152-FN-A authorized the New Hampshire Department of Transportation (NHDOT) to conduct a study of the approximately 3.5-mile section of the Spaulding Turnpike extending north from Exit 2 (Fox Run Road) in Newington to the Dover Toll Plaza just north of Exit 6. The study was initiated in 1990 and suspended in 1992 to allow completion of the Pease Surface Transportation Master Plan. The purpose of this feasibility study, which was resumed in 1997, is to build on the foundation of earlier studies and conceptually develop both a short range plan to address existing safety deficiencies, and to develop a range of long term improvement alternatives to be carried forward for detailed engineering and environmental studies. The Seacoast Metropolitan Planning Organization (MPO) has established the need for the Newington-Dover Turnpike improvements as a top priority.

Existing Conditions

Review of available traffic accident data and roadway geometry, analysis of existing traffic operating conditions, coupled with field observations and discussion with local officials and residents revealed a number of safety and traffic operational deficiencies. Such deficiencies include: high accident locations, substandard geometry at interchange ramps, inadequate merge, diverge and weaving distances between interchanges, inconvenient and inefficient traffic flow patterns, and system wide capacity constraints resulting in weekday peak period congestion and forced flow traffic volume conditions.

Interim Safety Improvements

In light of the existing safety and traffic operational deficiencies, a low cost interim improvement plan has been conceptually developed in concert with NHDOT staff, local officials and residents that addresses the most serious safety problems. The plan consists of eliminating dangerous traffic weaving sections of the Turnpike by closing Exit 4N (which is used to reverse direction in the median of the Turnpike), and providing a safer and more direct means to reverse direction, in conjunction with the relocation and reconfiguration of Exit 4 to increase acceleration and deceleration lanes and vehicle storage at the ramp termini with River Road. The plan is supported by the Town of Newington, is consistent with local planning, and is compatible with the range of long term improvement alternatives. Construction funding of the safety improvements is programmed for 2002, in anticipation of securing approval for engineering and right-of-way acquisition.

Future Condition

Travel demand projections based on regional employment and population projections and anticipated land use changes indicate an average annual traffic growth rate along the Turnpike of approximately 1.8 percent. Without infrastructure improvement, the entire Turnpike system within the study area will fail resulting in severe periods of weekday congestion (Level of Service F) and extreme levels of vehicle delay. Weekday PM peak hour 2025 traffic volumes will exceed available traffic capacity by approximately 71 percent.

Long Range Improvement Alternatives

A total of nine (9) long range conceptual improvement alternatives were developed to address the current and future mobility and local access deficiencies identified within the study area. Improvement concepts were developed for each interchange area and the Little Bay Bridges that strive to balance transportation efficiency with potential impacts to private property and environmental resources. Concept development was an incremental process of refinement based on input solicited at local officials meetings, public information meetings, and meetings with representatives of the NHDOT and the Pease Development Authority (PDA). No single long range alternative is without one or more shortcomings; they vary in levels of transportation efficiency, land use impact, cost, aesthetics, environmental impact, consistency with local land use and transportation planning and level of community support. All nine (9) alternatives, in addition to the No Build (or do nothing) alternative, are recommended to be considered further as part of the more detailed engineering and environmental studies process anticipated prior to selecting an alternative for eventual construction.

Citizen Involvement

A number of meetings were conducted during the course of the study to present study findings and conceptual solutions, and to solicit input from interested stakeholders. These meetings included:

Date	Place	Purpose
11/9/98	VHB, Bedford, NH	Presentation of initial improvement concepts to Newington official and Town Consultant.
2/1/99	Newington Town Offices	Public Information Meeting
2/3/99	Dover City Hall	Public Information Meeting

2/19/99	Pease Development Authority	Discussion of access alternatives and right-of-way impacts.
9/9/99	Newington Town Offices	Review of Interim and Long Term Improvement Concepts.

1

Introduction

The Spaulding Turnpike/Route 16 is a major arterial roadway linking the seacoast area with the Lakes Region and North Country. Within the 3.5 mile section of the Turnpike that extends from Exit 2 (Fox Run Road) in Newington north to Exit 6 (US 4 and Dover Point Road) in Dover, the Spaulding Turnpike serves the conflicting mobility demands of through traffic and the local access requirements of residents, shoppers, industry and recreational traffic. These conflicts and resulting peak hour congestion are particularly manifest during summer weekdays and weekends. Current traffic and safety conditions and consideration of future traffic volume projections underscore the need to proceed with the project development of both safety and transportation system capacity improvements to the Turnpike in the Newington-Dover study area. This need is consistent with the priority of proposed turnpike improvement projects recommended by the Seacoast Metropolitan Planning Organization (MPO).

Authorization and Study Objectives

NH Senate Bill 152-FN-A authorized the New Hampshire Department of Transportation (NHDOT) to conduct a study of an approximately 3.5-mile section of the Spaulding Turnpike extending north from the Gosling Road/Pease Boulevard interchange in Newington to the Dover Toll Plaza just north of Exit 6. The study was initiated in 1990 and suspended in 1992 to allow completion of the Pease Surface Transportation Master Plan. Since completion of the Pease study, the Seacoast Metropolitan Planning Organization (MPO) has developed a regional travel demand model as part of its long range planning effort, and the NHDOT has completed a long range study of the entire Route 16 corridor which encompasses the study area. The NHDOT has also recently completed the replacement of the Scammel Bridge and the reconstruction of the Boston Harbor Road intersection with US 4.

Vanasse Hangen Brustlin, Inc. (VHB) was retained by the NHDOT in 1997 to build on the foundation of earlier studies and conceptually develop both a short range plan to address existing safety deficiencies, and a long range plan to address current and future mobility needs. The need for immediate safety improvements and long range infrastructure improvements is apparent from the review of existing traffic operating deficiencies and analysis of future traffic (2025) volume projections.

This study does not address the issue of the Dover tolls and their possible relocation or elimination. A study of the toll issue as it affects the New Hampshire Turnpike System and the Spaulding Turnpike is being conducted by the NHDOT and the State Legislature. Study findings are expected to be available by September, 2000. While the issue of tolls has broad implications for the State, the locations of toll booths are not likely to change. Findings relative to the Dover tolls will be accommodated in more detailed studies of this segment of the Spaulding Turnpike.

Several short and long range improvement alternatives were developed and evaluated in light of current safety deficiencies, future traffic service requirements, design guidelines and public safety criteria, environmental resource constraints, land use impacts, right-of-way requirements, consistency with local transportation and land use planning, and cost. Conceptual plans were prepared for each alternative.

A recommended short range improvement plan has been developed that addresses the most serious safety deficiencies within the study area. The plan is the result of an incremental process of refining alternatives based on review meetings with NHDOT staff, municipal officials, and input received at meetings with local officials and the general public.

The long range improvement plan must address the transportation needs of the Seacoast communities and the region in a cost-effective manner; be permittable from a state and federal regulatory perspective; and be supported by local and regional public officials and citizens. Based on a macro level identification, screening and evaluation of conceptual alternatives, a number of alternatives, in addition to the No Build or Do Nothing, have been developed to be considered for further detailed engineering and environmental studies. The more detailed studies to be undertaken in the near future will be documented for compliance with state and federal environmental regulations and will be conducted within a dynamic public participation process, culminating in a public hearing and presentation of a preferred long range improvement plan.

Construction funding of the short range safety improvements is programmed for 2002, in anticipation of securing approval for engineering and right-of-way acquisition.

2

Base Conditions

Study Area

Figure 1 depicts the Spaulding Turnpike study area, by sub area, which extends from Exit 2 (Fox Run Road) in Newington north across the Little Bay Bridges to Exit 6 (US 4 and Dover Point Road) in Dover. Land use varies among residential (Boston Harbor Road, Dover Point Road and Nimble Hill Road), recreational (Hilton Park and bike path across the General Sullivan Bridge), commercial and the industry located along Boston Harbor Road, River Road, Woodbury Avenue, the Piscataqua River and at the Pease International TradePort. The study area is also the location of sensitive environmental resources which include tidal and nontidal wetlands and the need to protect water quality from the drainage and runoff impacts associated with land development and infrastructure improvements. Prehistoric, historic and cultural resources also abound in the study area, such as Hilton Park, Bloody Point, the General Sullivan Bridge, and the Isaac Dow House. In addition, a number of undeveloped or underdeveloped commercially zoned parcels of land are found on both sides of the study corridor, such as the site of the old Newington drive-in theater. The Pease International TradePort abuts the Exit 2 and Exit 3 sub areas.

Historic, archaeological and wetlands resources available from previous studies are depicted for the study are in Figure 2 for Dover and Figure 3 for Newington. Public recreational and park lands are also shown.

Deficiency Criteria

Mobility and safety deficiencies are identified to evaluate the existing infrastructure system under current and future travel demands, and to assess alternative improvement concepts in addressing current and future transportation needs. Deficiency categories are defined as follows:

- Traffic Capacity – A deficiency based on insufficient capacity is defined for those intersections or roadway segments that experience level of service (LOS) E or worse operations. Level of service is a term used to denote different operating conditions of a given roadway facility under various traffic volume demands.

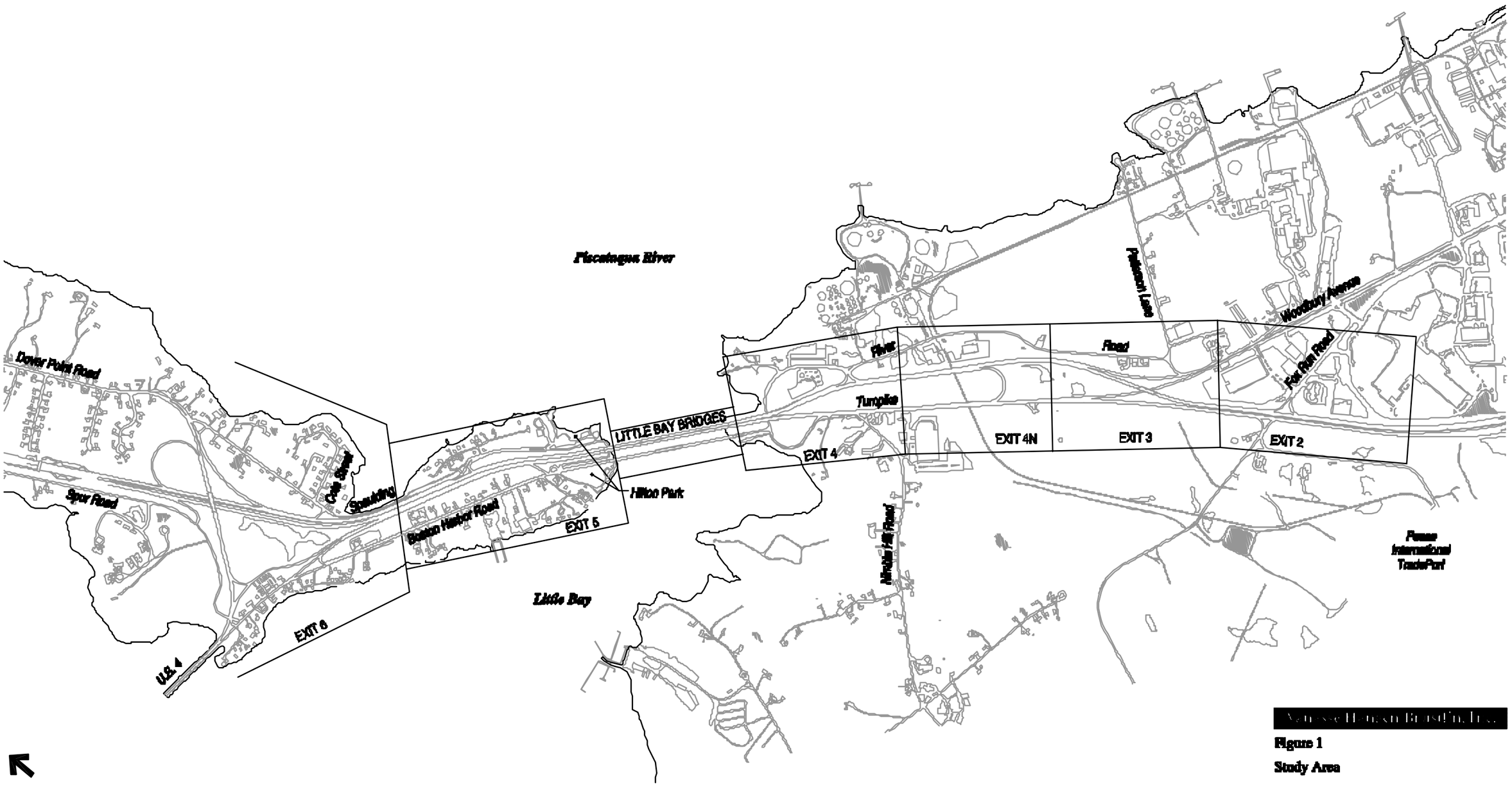

Figure 1

Study Area

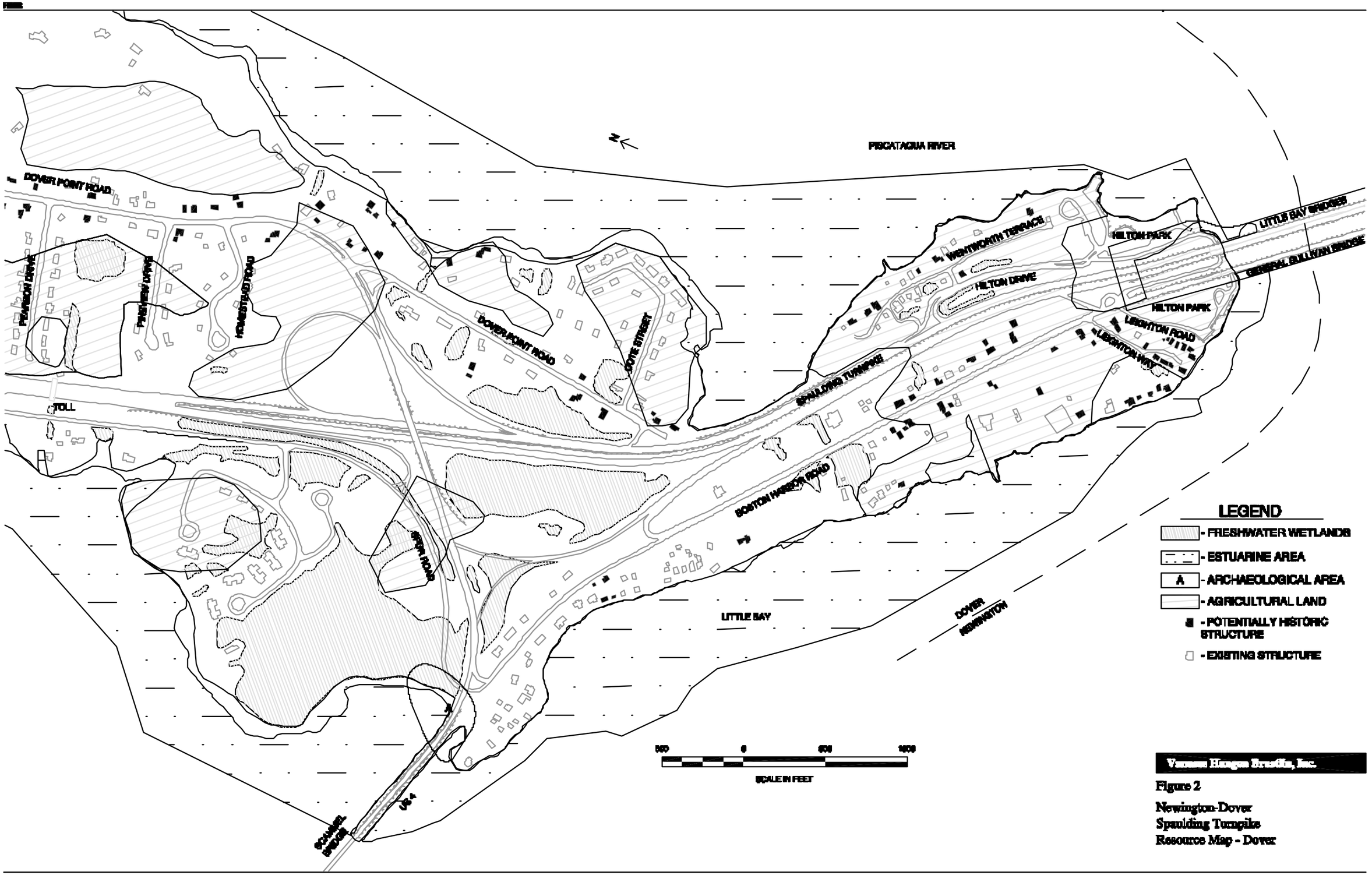

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Figure 2

Newington-Dover
Spaulding Turnpike
Resource Map - Dover

LEGEND

- FRESHWATER WETLANDS
- ESTUARINE AREA
- A - ARCHAEOLOGICAL AREA
- AGRICULTURAL LAND
- POTENTIALLY HISTORIC STRUCTURE
- EXISTING STRUCTURE

N

PISCATAQUA RIVER

PATTERSON LANE

BLOODY POINT

RIVER ROAD

SPAULDING TURNPIKE

WOODBURY AVENUE

FOX RUN ROAD

LITTLE BAY BRIDGES

GENERAL SULLIVAN BRIDGE

LITTLE BAY

PEASE INTERNATIONAL TRADEPORT

500 0 500 1000

SCALE IN FEET

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Figure 3

Newington-Dover
Spaulding Turnpike
Resource Map - Newington

The LOS criteria contained in the 1994 Highway Capacity Manual[1] (HCM) was used to evaluate traffic operations on the study area intersections and roadways. The HCM defines six levels of service and gives them letter designations ranging from LOS A to LOS F, with LOS A representing the best operating conditions and LOS F representing the worst. In general, LOS E represents the maximum flow rate or capacity on a roadway facility.

Capacity analyses have been performed for all of the critical types of operations within the study area, including: arterial segments, freeway segments, weaving segments, ramp junctions, merges and diverges, signalized intersections, and unsignalized intersections.

- Roadway Geometry – Geometric deficiencies exist when the criteria contained within the American Association of State Highway and Transportation Officials[2] (AASHTO) Policy on Geometric Design of Highways and Streets and/or the NHDOT Design Manual are not met for the design speed of the facility. The study of geometric deficiencies examines existing horizontal layout, existing vertical profile, and existing local roadway access.

- Accidents – Accident locations of concern are identified where on average five or more accidents have occurred per year over a 5-year period.

Data Sources

The data used to analyze and identify the existing roadway deficiencies originated from several sources.

- Accident Data
  Available accident data for the study area was obtained from the State of New Hampshire Police Department (1992-1997), Town of Newington Police Department (1993-1997) and City of Dover Police Department (1992-1996). The data was reviewed and is summarized in Figure 4 and Table 1 by location, frequency, type, severity and season.

- Geometric Data
  Existing roadway geometrics were obtained from NHDOT as-built roadway plans and aerial photography. In addition, field reconnaissance was performed to confirm the plan information. Existing peak-hour free-flow travel speeds were estimated through travel time runs conducted by VHB during field visits.

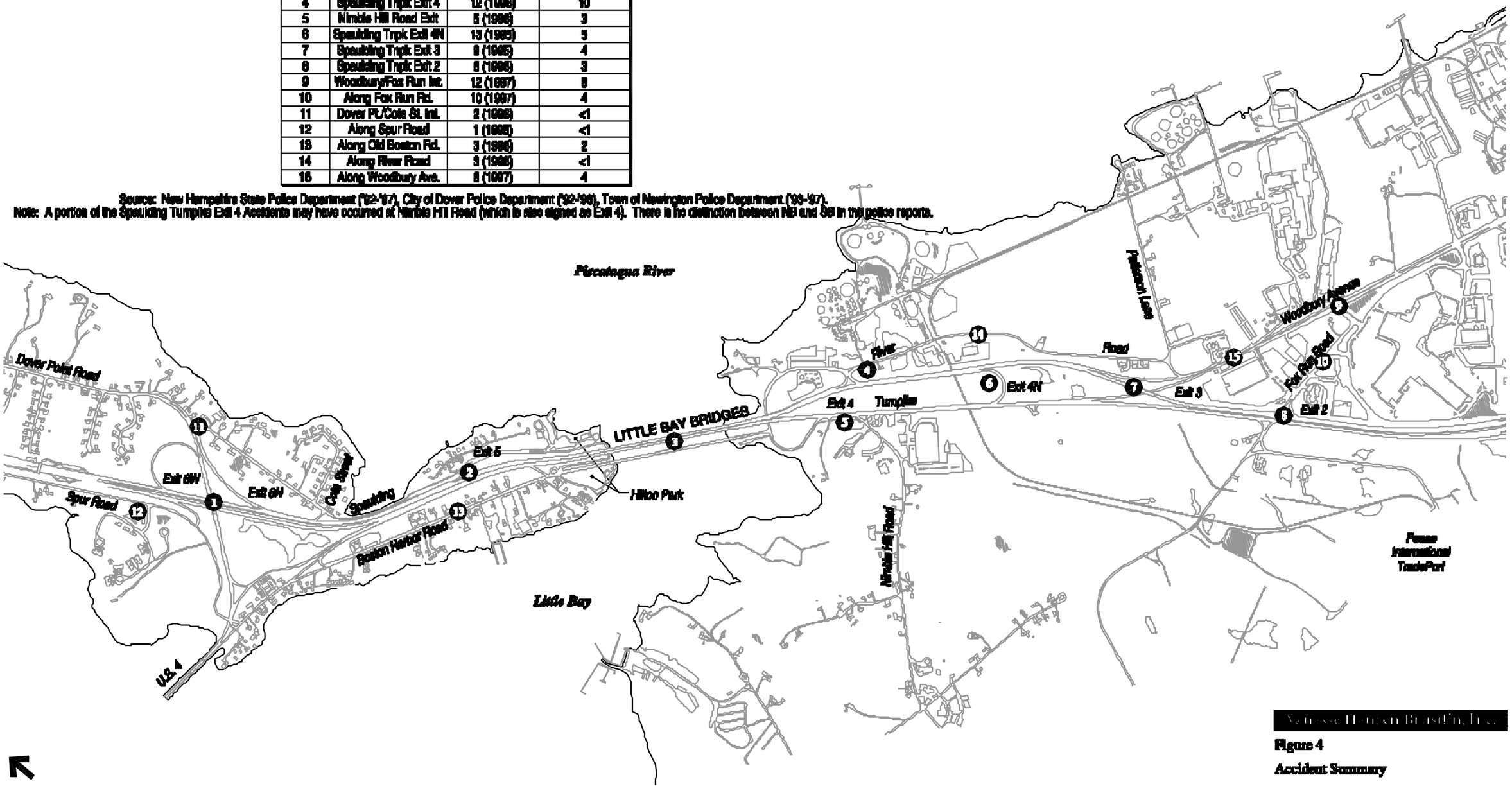
- Previous Studies
  Various other studies were obtained and reviewed. These studied include: the Kimball-Chase Newington-Dover studies, the Pease Surface Transportation

[1] Highway Capacity Manual, Special Report 209, published by the Transportation Research Board, Washington D.C., 1994.
[2] A Policy on Geometric Design of Highways and Streets, published by the American Association of State Highway and Transportation Officials, Washington, D.C., 1994.

5 Year Accident Summary

Area		Highest One	Average Over
No.	Description	Year Total (Year)	Recent 5 Years
1	Spaulding Tnpk Exit 9	9 (1994)	5
2	Spaulding Tnpk Exit 5	7 (1995)	3
3	Bridges/Town Line	30 (1995)	22
4	Spaulding Tnpk Exit 4	12 (1996)	10
5	Nimble Hill Road Exit	5 (1996)	3
6	Spaulding Tnpk Exit 4N	13 (1995)	5
7	Spaulding Tnpk Exit 3	6 (1995)	4
8	Spaulding Tnpk Exit 2	6 (1996)	3
9	Woodbury/Fox Run Int.	12 (1997)	8
10	Along Fox Run Rd.	10 (1997)	4
11	Dover Pt./Cole St. Int.	2 (1996)	<1
12	Along Spur Road	1 (1995)	<1
13	Along Old Boston Rd.	3 (1996)	2
14	Along River Road	3 (1995)	<1
15	Along Woodbury Ave.	6 (1997)	4

Source: New Hampshire State Police Department ('92-'97), City of Dover Police Department ('92-'96), Town of Newington Police Department ('93-'97).
Note: A portion of the Spaulding Turnpike Exit 4 Accidents may have occurred at Nimble Hill Road (which is also signed as Exit 4). There is no distinction between NB and SB in the police reports.



Portsmouth Herald

Figure 4

Accident Summary

INTERSECTION	ACCIDENT SUMMARY																					TOTAL	PERCENT
	Within Fox Run Mall	Fox Run Road / Woodbury Ave	Spaulding Tpk / Exit 2	Spaulding Tpk / Exit 3	Spaulding Tpk / Exit 4	Spaulding Tpk / Exit 4N Turnaround	Spaulding Tpk / Nimble Hill	Spaulding Tnpk / Little Bay Bridge	Spaulding Tnpk / Exit 5	Spaulding Tnpk / Exit 6	Spaulding Tnpk / Dover Toll Plaza	Dover Point Road / Cote Street	Along Woodbury Avenue	Along Fox Run Road	Along River Road	Along Nimble Hill Road	Along Dover Point Road	Along Old Boston Road	Along Spur Road	Along Cote Street	Along Spaulding Tpk.		
YEAR																							
1992	18	3	1	2	4	4	2	9	2	3	9	0	3	1	1	0	0	1	0	0	2	65	10%
1993	6	3	2	2	9	2	4	30	0	3	13	0	1	1	0	0	1	1	1	0	3	82	12%
1994	13	6	1	3	9	2	1	23	4	9	12	0	2	2	0	2	1	2	0	1	5	98	15%
1995	52	12	5	9	8	13	3	25	1	6	12	1	4	3	0	0	0	1	0	0	4	159	24%
1996	50	8	6	3	12	1	5	24	7	5	20	1	3	4	3	3	2	3	1	0	10	171	26%
1997	42	12	0	2	8	1	1	1*	0*	0*	0*	0*	6	10	0	0	0*	0*	0*	0*	2	85	13%
Total	181	44	15	21	50	23	16	112	14	26	66	2	19	21	4	5	4	8	2	1	26	660	
TYPE																							
Angle	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	4	1%
Rear-End	3	1	2	1	1	1	2	11	2	4	10	0	0	0	0	0	0	1	0	0	1	40	6%
Head-on	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0%
Sideswipe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
Fixed Object	2	0	5	5	8	6	1	33	3	6	13	0	0	1	1	1	2	2	2	0	8	99	15%
Other/Unknown	175	42	8	15	41	16	13	66	9	16	43	2	19	20	3	4	2	4	0	1	17	516	78%
Total	181	44	15	21	50	23	16	112	14	26	66	2	19	21	4	5	4	8	2	1	26	660	
SEVERITY																							
Property Damage	11	2	3	2	6	2	3	15	0	3	10	0	4	2	0	2	2	3	0	1	4	75	11%
Personal Injury	28	10	5	3	9	2	2	28	6	6	18	2	9	4	1	0	1	2	2	0	2	140	21%
Fatality	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	3	0%
Unknown/None	142	32	7	16	34	19	11	69	8	16	38	0	6	15	3	3	0	3	0	0	20	442	67%
Total	181	44	15	21	50	23	16	112	14	26	66	2	19	21	4	5	4	8	2	1	26	660	
DAY OF WEEK																							
Mon-Fri	118	35	9	15	34	21	13	89	12	20	54	2	15	13	3	3	4	8	1	1	19	489	74%
Sat-Sun	63	9	6	6	16	2	3	23	2	6	12	0	4	8	1	2	0	0	1	0	7	171	26%
Total	181	44	15	21	50	23	16	112	14	26	66	2	19	21	4	5	4	8	2	1	26	660	
SURFACE CONDITION																							
Dry	55	15	7	7	26	13	7	52	10	20	44	2	9	3	1	3	2	5	2	1	8	292	44%
Wet	17	3	1	1	4	3	4	9	2	2	8	0	3	3	0	0	1	1	0	0	1	63	10%
Snow/Ice	2	2	7	5	12	4	2	46	2	3	13	0	0	1	0	1	1	2	0	0	11	114	17%
Other/Unknown	107	24	0	8	8	3	3	5	0	1	1	0	7	14	3	1	0	0	0	0	6	191	29%
Total	181	44	15	21	50	23	16	112	14	26	66	2	19	21	4	5	4	8	2	1	26	660	
WEATHER																							
Clear/Cloudy	61	18	9	8	31	15	7	63	11	23	52	2	9	5	1	4	4	7	2	1	12	345	52%
Rain	7	1	0	1	4	1	4	6	1	0	5	0	3	1	0	0	0	1	0	0	1	36	5%
Snow/Ice	3	0	6	3	9	2	1	33	2	3	8	0	0	1	0	0	0	0	0	0	6	77	12%
Other/Unknown	110	25	0	9	6	5	4	10	0	0	1	0	7	14	3	1	0	0	0	0	7	202	31%
Total	181	44	15	21	50	23	16	112	14	26	66	2	19	21	4	5	4	8	2	1	26	660	
SEASON																							
Winter(Dec-Feb)	52	15	3	8	21	10	4	61	7	10	27	0	5	8	1	1	2	1	1	0	6	243	37%
Spring(Mar-May)	46	11	4	5	8	3	1	9	1	8	13	0	4	2	1	2	0	5	0	0	12	135	20%
Summer(Jun-Aug)	44	8	5	3	9	5	5	20	2	5	13	2	2	8	0	2	1	1	1	1	2	139	21%
Fall(Sept-Nov)	39	10	3	5	12	5	6	22	4	3	13	0	8	3	2	0	1	1	0	0	6	143	22%
Total	181	44	15	21	50	23	16	112	14	26	66	2	19	21	4	5	4	8	2	1	26	660	

* Incomplete Data - City of Dover accident reports were not available for 1997.

Source: New Hampshire State Police Reports, Town of Newington Police Reports, and City of Dover Police Reports

Table 1
Summary of Traffic Accidents

Master Plan Study and the Town of Newington Master Plan. These studies were used to supplement the other data sources.

Travel Demand

Weekday peak hour/seasonally adjusted traffic volumes for 1996 were obtained from the Seacoast "Mega-model" traffic model developed by Resource Systems Group, Inc. (RSG). The model generated traffic volumes were compared to 1996 historical traffic volume counts conducted by the NHDOT, Rockingham Planning Commission (RPC) and Strafford Regional Planning Commission (SRPC). Once the 1996 model numbers were validated, year 2010 and 2025 weekday PM peak hour traffic volumes were generated by the traffic model based on land use projections provided by the RPC and SRPC. The future traffic numbers were then checked by VHB staff for completeness and reasonableness and reviewed by NHDOT prior to analysis. The 1996, 2010, and 2025 modeled traffic volumes are depicted in Figures 5, 6 and 7, respectively.

It should be noted that the travel demand model forecasts summer weekday PM peak hour traffic volumes, and that the predominant direction of travel during this period is northbound. (Approximately 61 percent of the total volume over the bridges is NB.) PM peak hour level of service analysis of current conditions, as discussed below at each interchange area, indicates capacity constrained conditions exist in the northbound direction throughout the study area from Exit 3 to Exit 6. Given that the predominant or higher traffic flows are southbound in the weekday AM peak hour, similar capacity constrained conditions would be expected if the existing AM peak hour was similarly modeled and analyzed.

Future Spaulding Turnpike, Year 2025 PM peak hour traffic projections represent an average annual increase of approximately 1.8 percent. These projected volumes take into account the current capacity constrained condition and reflect an approximate ten percent volume reduction due to a travel demand management program of increased transit ridership, ride-sharing and peak spreading.

Deficiency Analysis

Exit 2 and Surrounding Area Deficiencies

Area Description

Exit 2 is located within the Town of Newington. Access is provided to and from Fox Run Road at this exit. Many of the trips on this roadway are connected to the retail establishments along Woodbury Avenue. This exit is configured as right-in / right-out access from the northbound barrel of the Spaulding Turnpike. There was access

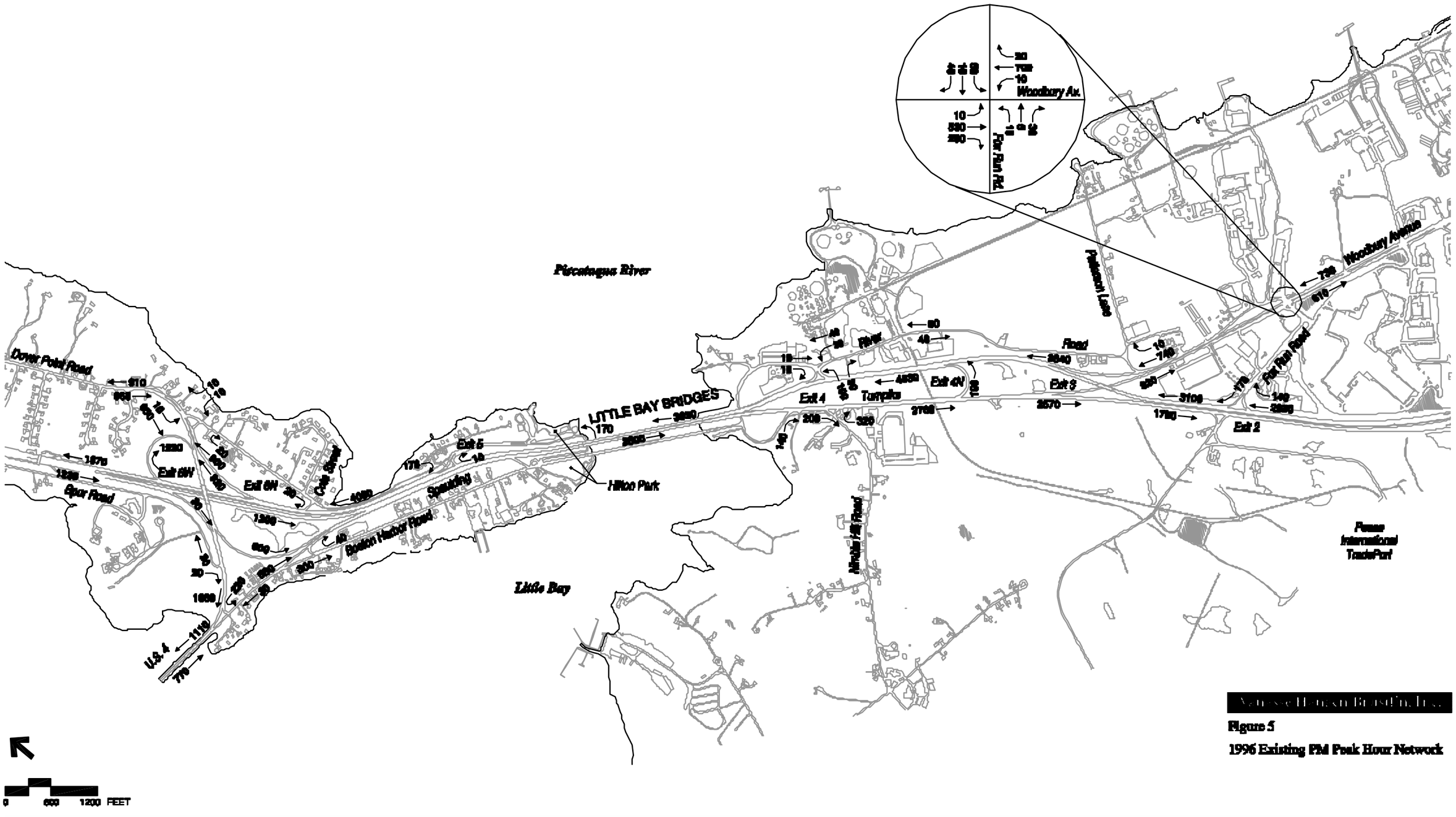


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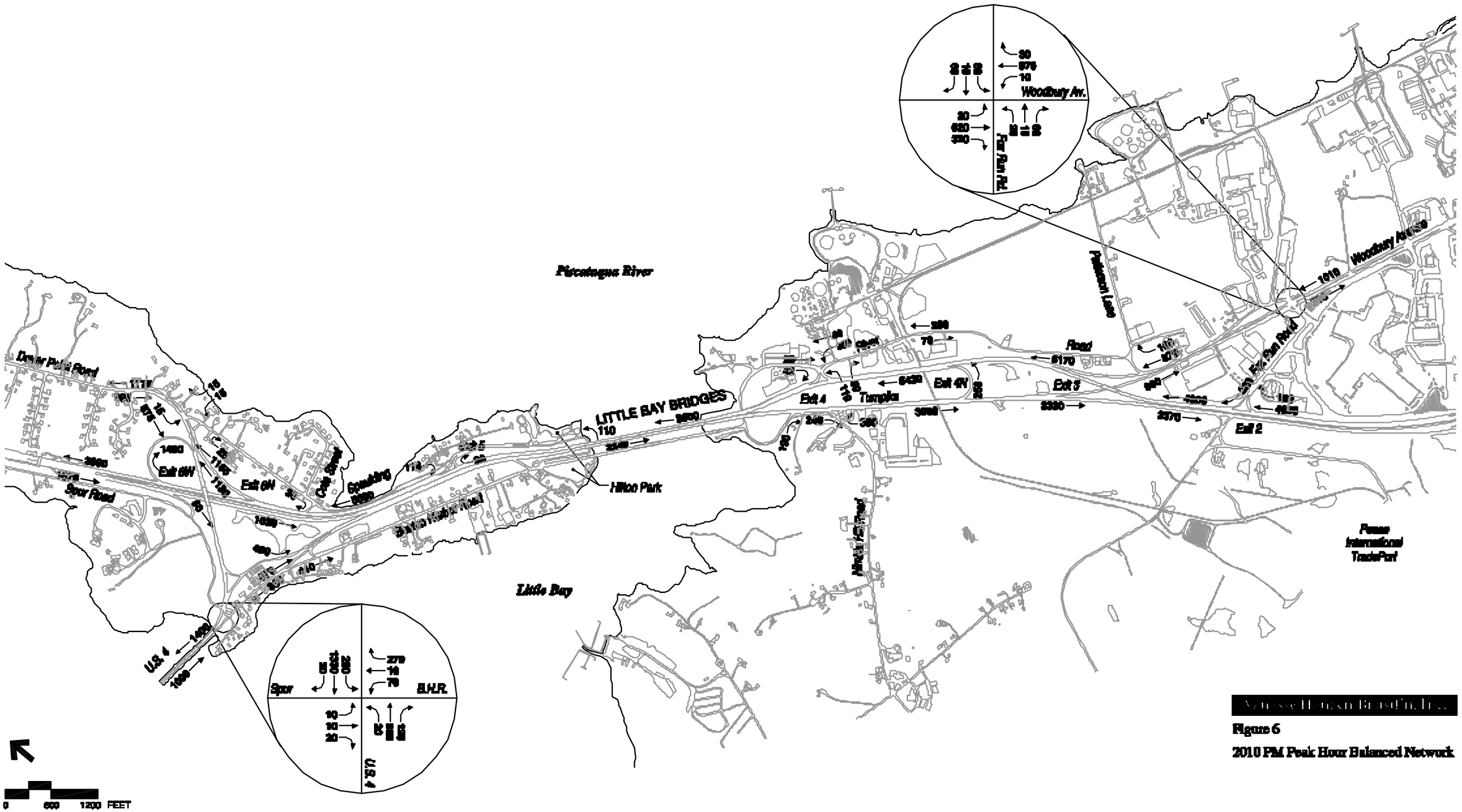
Figure 5

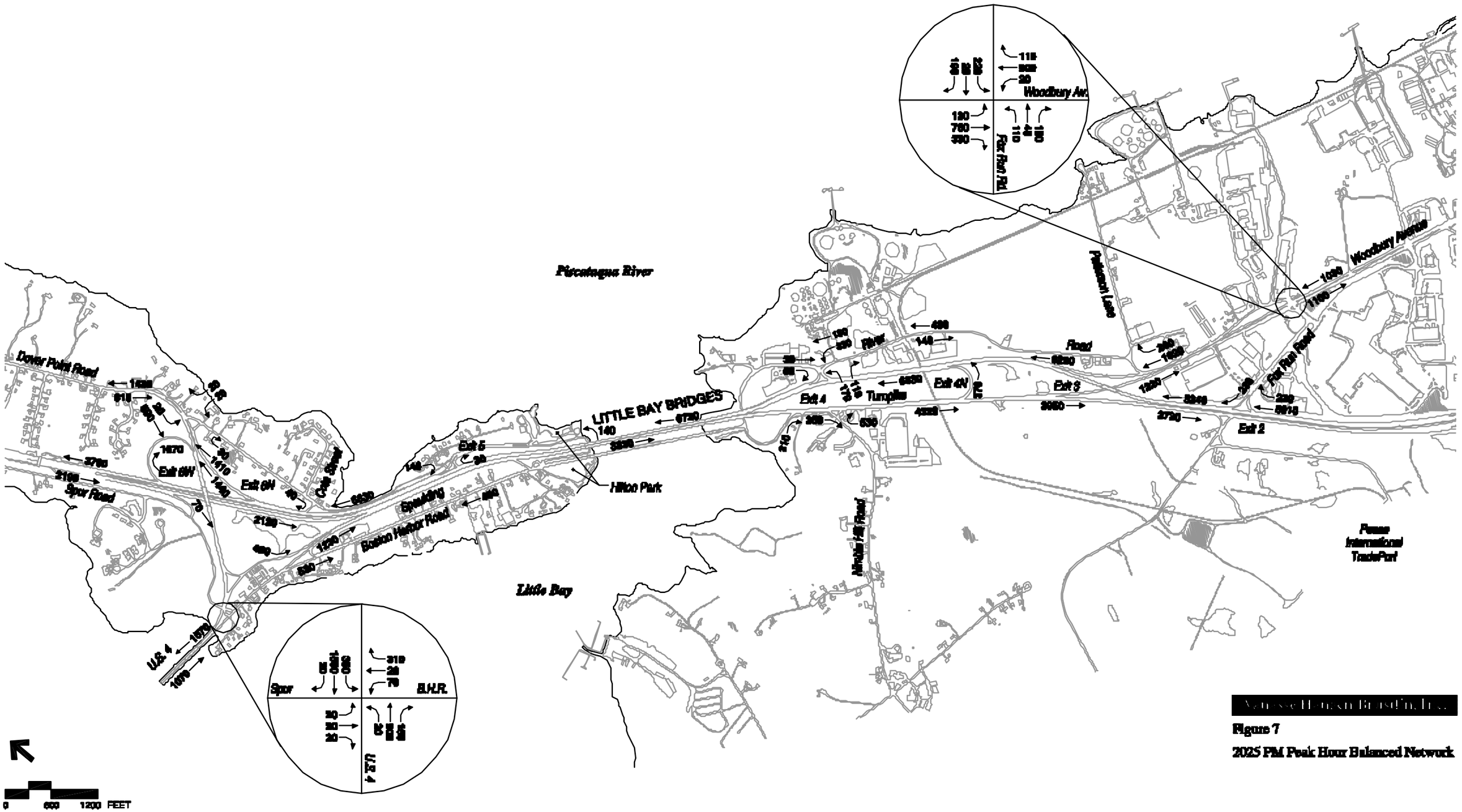
1996 Existing PM Peak Hour Network



Portsmouth Traffic Study

Figure 6

2010 PM Peak Hour Balanced Network



Portsmouth Circle

Figure 7

2025 PM Peak Hour Balanced Network

at one time to the Pease Tradeport from the southbound barrel of the Spaulding Turnpike but the exit is currently closed to traffic.

The Spaulding Turnpike is a four-lane (two lanes in each direction with 6' inside and 8' outside paved shoulders) median divided roadway in the vicinity of Exit 2 with a posted speed limit of 55 miles-per-hour (mph) and carries approximately 3,100 vehicles-per-hour (vph) northbound and 1,750 vph southbound vehicles (1996 weekday PM peak hour volumes). Immediately to the south, the Turnpike is a six-lane (three lanes in each direction with 10' wide paved shoulders). The three lanes northbound taper into two lanes as the northbound barrel approaches Exit 2. Approximately 140 vph exited and 170 vph entered the Turnpike via Exit 2. The traffic volumes are projected to increase to 5,240 vph northbound, 2,730 vph southbound, 230 vph entering and 230 vph exiting the Turnpike via Exit 2 by 2025.

The Exit 2 area also includes the intersection of Fox Run Road and Woodbury Avenue which is a four-way signalized intersection. The signal operates with three phases; Woodbury lefts, Woodbury throughs, and side streets.

Existing and future deficiencies are summarized below.

Accidents

The intersection of Woodbury Avenue and Fox Run Road (Figure 4, #9) has averaged 8 accidents per year over the most recent 5 years (1993-1997) of available accident data. The highest number of accidents (12) occurred in 1997. Eighty percent (80%) of the accidents occurred during the weekday with less than 10% of the accidents potentially attributable to adverse weather conditions (rain/snow/ice).

While averaging four accidents per year during the past five years, the segment of Fox Run Road between the Turnpike and Woodbury Avenue (Figure 4, #10) has experienced a dramatic increase from one accident in 1992 to ten (10) reported accidents in 1997. Most accidents were found to have occurred near the Home Quarters' drive. It is possible the accident increase is attributed to a combination of factors: increased volume of traffic on Fox Run Road, limited sight distance, and proximity of the HQ driveway to the exit ramp.

Capacity Deficiencies

No capacity deficiencies were found to exist along the roadway segments or study area intersections within the Exit 2 area under 1996 traffic volumes. However, under the 2025 traffic volume projections, the following roadway segments and intersections are projected to fail as depicted in Figure 9:

#2 Fox Run Road to Spaulding Turnpike Exit 2 On-ramp (Ramp Junction LOS F).
#2 Spaulding Turnpike to Fox Run Road Exit 2 Off-ramp (Ramp Junction LOS F).
#1 Woodbury Avenue & Fox Run Road intersection (Signalized LOS F).

#3 Spaulding Turnpike northbound segment Exit 2 to Exit 3 (Freeway LOS F).

Geometric Deficiencies

While there is adequate 600-foot deceleration length for the right-most lane on the northbound side of the Turnpike, the horizontal curve to meet Fox Run Road has a 150-foot radius rated for a 20 mph travel speed. Many of the vehicles exiting from the turnpike were observed to be traveling in excess of this speed. This speed/distance condition is compounded by the proximity of the Home Quarters' drive entrance to the on and off-ramps to the Spaulding Turnpike. Vehicles entering the site from the Turnpike were observed to come off the ramp and slow down and sometimes stop abruptly to turn left and enter the HQ site. This can create problems for a following vehicle and increase the potential for rear end collisions. It should be noted that as part of the Home Quarters driveway approval, it was agreed that the NHDOT would close Exit 2 if significant safety problems resulted from traffic generated by Home Quarters operations.

The on-ramp to the Turnpike from Fox Run Road has a horizontal curve with a 250-foot radius. A geometric deficiency exists at this on-ramp junction with the Spaulding Turnpike due to the short 250-foot acceleration lane to merge prior to the Woodbury Avenue bridge with the Turnpike northbound traffic (with a posted speed of 50 mph).

Exit 3 and Surrounding Area Deficiencies

Area Description

Exit 3 is located in the Town of Newington and is a southbound only exit from the Spaulding Turnpike to Woodbury Avenue. Access to Woodbury Avenue is provided through a left-hand exit passing under the northbound barrel of the Spaulding Turnpike in a southeasterly direction toward the main commercial and industrial area of Newington and points within Portsmouth. This is a high-speed exit, but there is a speed reduction from 50 mph to 35 mph as the roadway passes under the northbound Spaulding Turnpike overpass.

The Spaulding Turnpike is a four-lane (two lanes in each direction with 4' inside and 10' outside paved shoulder) median divided roadway in the vicinity of Exit 3 with a posted speed limit of 50 mph and carries approximately 3,840 vph northbound and 2,570 vph southbound (1996 weekday PM peak hour volumes).). Approximately 820 vph exited and 740 vph entered the Turnpike via Exit 3. The traffic volumes are projected to increase to 6,260 vph northbound, 3,950 vph southbound, 1,220 vph exiting and 1,020 vph entering the turnpike via Exit 3 by 2025.

The Exit 3 area also includes the intersections of Woodbury Avenue at Patterson Lane, and Patterson Lane at River Road. Both intersections are unsignalized "T" configurations. Patterson Lane is one-way eastbound. In addition, a median along Woodbury Avenue eliminates access to Patterson Lane from southbound Woodbury Avenue.

Accidents

Average annual accident experience along roadways and primary intersections within the Exit 3 area was found to be less than 5 accidents per year.

Capacity Deficiencies

Capacity deficiencies exist along the following roadway segments and study area intersections within the Exit 3 area under 1996 traffic volumes as depicted in Figure 8:

#3 Northbound Woodbury Avenue on-ramp merge with the Spaulding Turnpike (Ramp Junction LOS E).
#5 Northbound Spaulding Turnpike segment from Exit 3 to Exit 4 (Freeway LOS F).

Additionally, under the 2025 traffic volume projections, the following roadway segments and intersections are projected to be deficient as depicted in Figure 9:

#4 Northbound Woodbury Avenue on-ramp merge with the Spaulding Turnpike (Ramp Junction degrades to LOS F).
#5 Southbound Spaulding Turnpike segment from Exit 4N to Exit 3 (Freeway LOS E).

Geometric Deficiencies

There appears to be no horizontal or vertical alignment deficiencies in this area. While there is a crest vertical curve along the Spaulding Turnpike in both the northbound and southbound directions, there is adequate vertical sight distance due to the length of the vertical curves and the gradual grade changes. (The K-values[3] for the vertical curves are in excess of 625, which corresponds to a design speed of 70 mph.) This profile is acceptable given the posted speed limit of 50 mph. It should be noted, however, that the southbound left hand exit onto Woodbury Avenue is contrary to driver expectation, and that state and national standards strongly recommend against the use of left-hand off-ramps, particularly where they intermix with right-handed entrances and exits as is the case in this area.

[3] K-value is a measure of the rate of curvature of vertical curves; the higher the value, the smoother the curve.

1996 Existing Deficiency Analysis

Area No.	Description	Deficiency Remarks
1	Spaulding Turnpike - Exit 2	Substandard curve radii; Short acceleration lane; Nearby unsignalized intersection at HQ
2	Woodbury Ave. at Fox Run Road	High Accident Rate
3	Spaulding Turnpike - Exit 3	Merge Operation - LOS E
4	Spaulding Turnpike - Exit 4N	Short Deceleration lane; Merge - LOS F; Moderate accident rate
5	Spaulding Tnpk. (South of Exit 4 - east)	Freeway Operation - LOS F (northbound); Weaving Operation - LOS E (northbound)
6	Spaulding Turnpike - Exit 4 (west side)	Substandard acceleration / deceleration / weaving lengths
7	Spaulding Turnpike - Exit 4 (east side)	Merge / Diverge - LOS F; High accident rate; Substandard radii; Confusing signage
8	Little Bay Bridge	High Accident Rate; Freeway Operations - LOS F
9	Hilton Park Access	One-way operation hinders access to Hilton Park and Boston Harbor Road
10	Spaulding Turnpike Exit 5	Merge / Diverge - LOS F; Substandard deceleration lane
11	Spaulding Turnpike (South of Exit 5)	Freeway Operation - LOS F
12	On-ramp from Cote Drive	Merge - LOS F; Poor sight distance
13	Spaulding Turnpike - Exit 6	Weaving Operation - LOS F
14	U.S. Route 4	Arterial Operation - LOS E
15	Dover Point Road	Arterial Operation - LOS E
16	Spaulding Tnpk. - between Exits 6N and 6W	Freeway Operation - LOS E

LOS = Level of Service

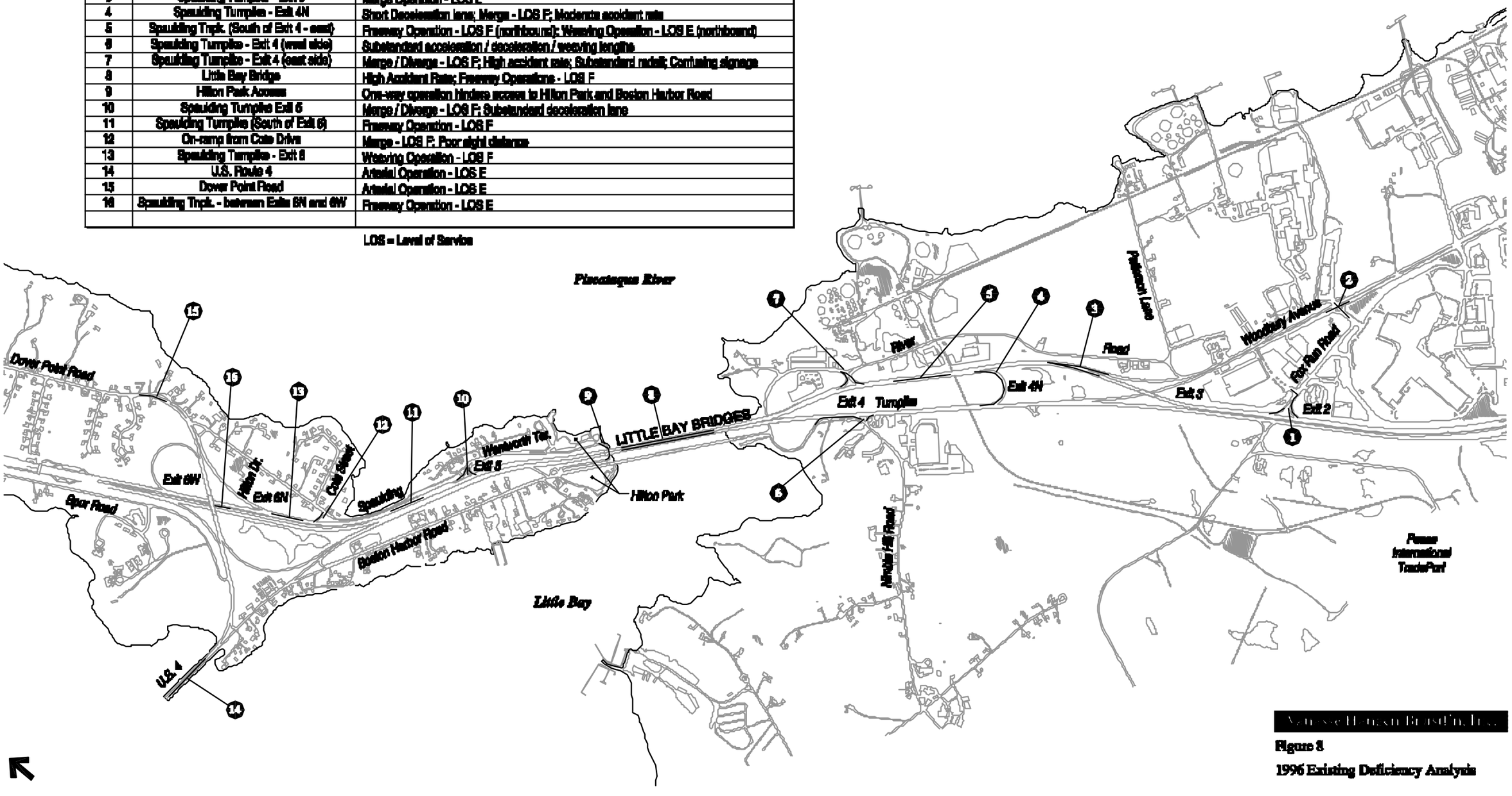


Figure 8

1996 Existing Deficiency Analysis

Additional Future Deficiencies

Area No.	Description	Deficiency Remarks
1	Woodbury Ave. at Fox Run Road	Signalized Intersection Operation - LOS F
2	Spaulding Turnpike - Exit 2	Merge/Diverge Operations - LOS F
3	Spaulding Tnpk (South of Exit 3 - east)	Freeway Operation - LOS F (Northbound)
4	Spaulding Turnpike - Exit 3	Merge Operation - LOS F (Northbound)
5	Spaulding Tnpk. (South of Exit 4N - west)	Freeway Operation - LOS E (Southbound)
6	Spaulding Turnpike - Exit 4N	Ramp Operation - LOS F
7	Spaulding Tnpk. (South of Exit 4 - west)	Freeway Operation - LOS E (Southbound); Weaving Operation - LOS E (Southbound)
8	Spaulding Tnpk. - Exit 4 (west side)	Merge/Diverge Operations - LOS F
9	Spaulding Turnpike - Exit 4 (west side)	Weaving Operation - LOS E (between River Road Extension and Nimble Hill Road)
10	Spaulding Turnpike (River Rd. on Ramp)	Merge Operation - LOS F
11	Spaulding Turnpike (South of Exit 6)	Freeway Operation - LOS F (Southbound)
12	Route 4 at Dover Point Road	Unsignalized Operation - LOS E
13	U.S. Route 4	Arterial Operation - LOS F
14	Spaulding Turnpike - Exit 6N	Diverge Operation - LOS F
15	Spaulding Turnpike (Exit 6W)	Ramp Operation - LOS F
16	Dover Point Road at Cote Street	Unsignalized Operation - LOS F
17	Spaulding Turnpike (North of Exit 6W)	Freeway Operation - LOS E
18	Little Bay Bridge (S.B.)	Freeway Operation - LOS E
19	Spaulding Turnpike (South of Exit 4 NB)	Weaving Operation - LOS F

LOS = Level of Service

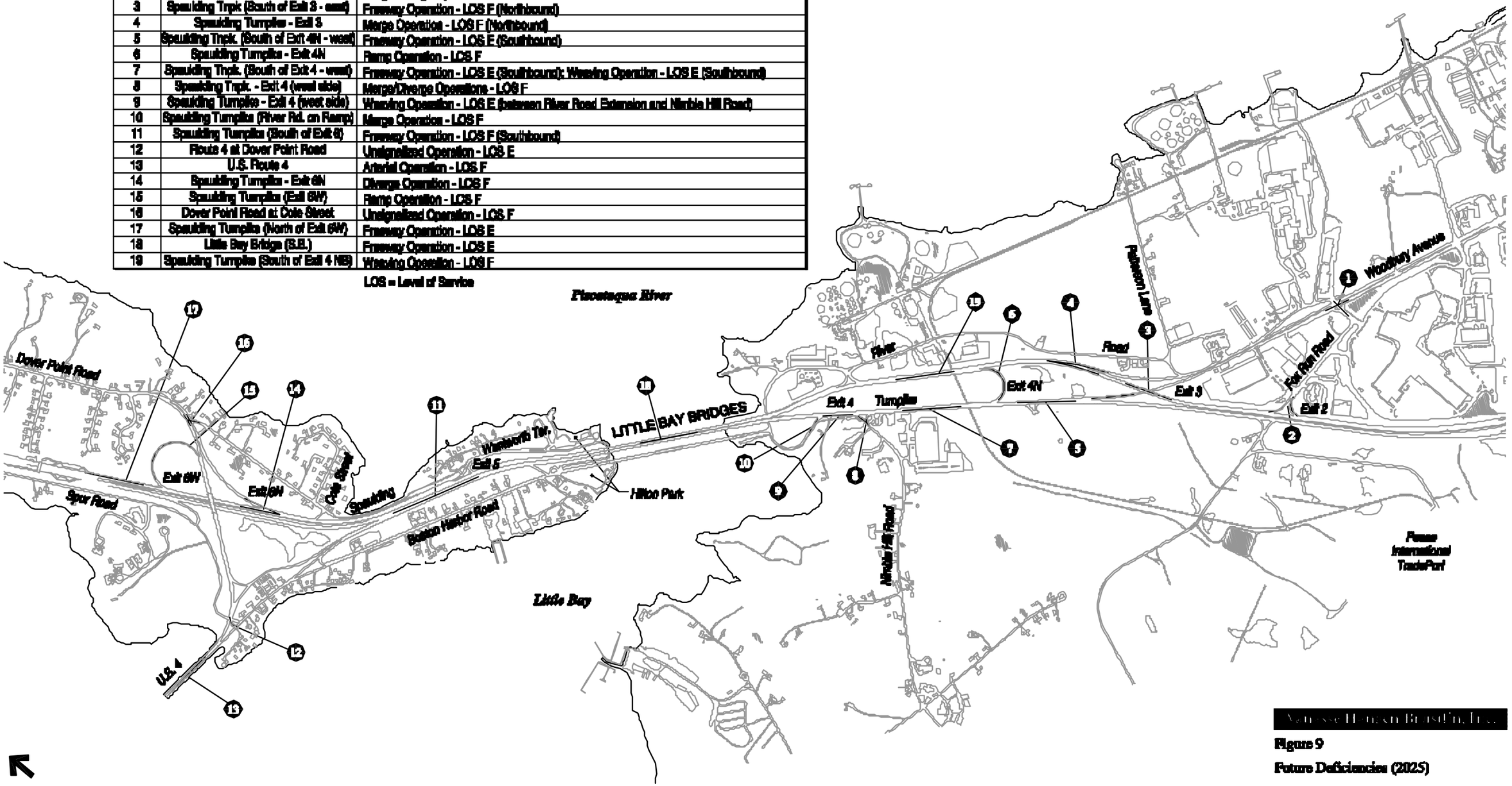


Figure 9

Future Deficiencies (2025)

Exit 4N Deficiencies

Area Description

This exit provides a change in direction on the Spaulding Turnpike from southbound to northbound via a 180 degree loop ramp within the wide median.

The Spaulding Turnpike is a four-lane (two lanes in each direction with 10' inside and 10' outside paved shoulders) median divided roadway in the vicinity of Exit 4N with a posted speed limit of 50 mph and carries 4,030 vph northbound and 2,760 vph southbound (1996 weekday PM peak hour volumes). Approximately, 190 vph southbound vehicles currently reverse direction at Exit 4N. PM peak hour traffic volumes are projected to increase to approximately 6,630 vph northbound, 4,320 vph southbound and 370 vph on Exit 4N by 2025. It should be noted that some of the U-turns are eastbound US 4 to the Spaulding Turnpike northbound and NH 16/Dover Point Road traffic.

Accidents

Exit 4N turnaround (Figure 4, #6) has averaged 5 accidents per year over the most recent 5 years of available accident data (1992-1996). The greatest number of accidents (13) occurred in 1995. The accident reports do not specify exactly where the accidents occurred along the turnaround, but the following is noted:

- Ninety percent (90%) of the accidents occurred during the weekday.
- Sixty percent (60%) of the accidents occurred during dry conditions. Seventeen percent (17%) of the accidents occurred during the winter months with adverse weather conditions (rain/snow/ice). Twenty-three percent (23%) of the accidents were not classified by road and weather condition.

Capacity Deficiencies

Capacity deficiencies exist along the following road segments and study area ramp junctions within the Exit 4N area under 1996 traffic volumes as depicted in Figure 8:

#4 Exit 4N ramp junction with the Spaulding Turnpike northbound (Ramp Junction LOS F).
#5 Northbound Spaulding Turnpike segment from Exit 4N to Exit 4 (Freeway LOS F).
#5 Spaulding Turnpike northbound weave from Exit 4N to Exit 4 (Weave LOS E).

Additionally, under the 2025 traffic volume projections, the following roadway segments and ramp junctions are projected to be deficient as depicted in Figure 9:

#7 Southbound Spaulding Turnpike segment from Exit 4 to Exit 4N (Freeway LOS E).
#7 Spaulding Turnpike southbound weave from Exit 4 to Exit 4N (Weave LOS E).
#19 Spaulding Turnpike northbound weave from Exit 4N to Exit 4 (Weave degrades to LOS F).

Geometric Deficiencies

The horizontal roadway geometry in this area is a contributing factor to the safety concerns that are evidenced by the accident history. The deficiencies are as follows:

- The 200 foot curve radius of the Exit 4N south-to-north loop ramp provides a safe operating speed of 20 mph. This in itself would not be problematic, but some southbound vehicles are traveling in excess of 50 mph in the high speed lane in advance of the deceleration lane and exit ramp. The accident history on the ramp suggests that vehicles travel the ramp at too great a speed for the curvature.

- The short weaving distance between Nimble Hill Road and Exit 4N contributes to the projected operational failure and safety concerns associated with that weave. Entering vehicles must quickly accelerate to the speed of the through traffic, weave across to the high speed lane, and then decelerate for Exit 4N, all within 1,500 feet. This same operation occurs between Nimble Hill Road and Exit 3, but the available distance (2,600 feet) is greater.

- The same deficient weave occurs on the northbound side of the Turnpike, only in reverse order. Vehicles entering the northbound Turnpike from the left hand side of the roadway must accelerate to cross the through traffic in order to gain access to River Road at Exit 4.

The above weaving deficiencies are significant since the mix of slow moving weaving vehicles with the high speed and high volume of through vehicles results in operational difficulties and higher accident potential.

Exit 4 and Surrounding Area Deficiencies

Area Description

This exit provides access to River Road on the northbound side of the Spaulding Turnpike and to Nimble Hill Road on the southbound side. At both locations, the access is controlled by right-in/right-out lanes with a delta island separating traffic.

The Spaulding Turnpike is a four-lane (two-lanes in each direction with 10' inside and 10' outside paved shoulders) median divided roadway in the vicinity of Exit 4 with a posted speed limit of 50 mph and carries approximately 3,930 vph northbound and 2,640 vph southbound (1996 weekday PM peak hour volumes).). Approximately 130 vph exited and 170 vph entered the Turnpike via Exit 4, River Road. Additionally, approximately 200 vph exited and 320 vph entered the turnpike via Exit 4, Nimble Hill Road. Traffic volumes are projected to increase to 6,720 vph northbound and 4,140 vph southbound on the turnpike by 2025. Approximately 280 vph and 690 vph are projected, respectively, to exit and enter the Turnpike at Exit 4, River Road. Approximately 350 vph and 530 vph are projected, respectively, to exit and enter the Turnpike at Exit 4, Nimble Hill Road.

Accidents

The intersection of the Spaulding Turnpike and Exit 4 (River Road) has averaged 10 accidents per year (Figure 4, #4) over the most recent 5 years of available accident data (1993-1997). The greatest number of accidents (12) occurred in 1996. Seventy percent (70%) of the accidents occurred during the weekday. Additionally, 25% of the accidents occurred during the winter months during adverse weather conditions and 16 percent of the recorded accidents involve striking fixed objects. Collectively, these statistics indicate that speed, weather, geometry, shortness of the exit ramp, and the volume of traffic along the roadway combine to create safety concerns.

The intersection of the Spaulding Turnpike and Exit 4 (Nimble Hill Road) has averaged 3 accidents per year (Figure 2, #5) based on the most recent 5 years of available data. It should be noted that the State of New Hampshire and Town of Newington accident reports do not always indicate whether an accident occurred on northbound Exit 4 (River Road exit) or southbound Exit 4 (Nimble Hill exit). Since signs do not necessarily call out Nimble Hill Road as "Exit 4" like the River Road exit does, all accidents identified simply as Exit 4 were assigned to the River Road exit.

Capacity Deficiencies

Capacity deficiencies exist along the following roadway segments and study area intersections within the Exit 4 area under 1996 traffic volumes as depicted in Figure 8:

#7 Northbound Spaulding Turnpike off-ramp junction (Ramp Junction LOS F).
#7 Northbound Spaulding Turnpike on-ramp junction (Ramp Junction LOS F).
#5 Northbound Spaulding Turnpike segment from Exit 4 to Little Bay Bridge (Freeway LOS F).

Additionally, under the 2025 traffic volume projections, the following roadway segments and intersections are projected to be deficient as depicted in Figure 9:

#10 Southbound River Road on-ramp junction with the Spaulding Turnpike (Merge

LOS F).

#8 Southbound Spaulding Turnpike off-ramp junction (Ramp Junction LOS F).

#8 Southbound Spaulding Turnpike on-ramp junction (Ramp Junction LOS F).

#9 Spaulding Turnpike southbound weave between River Road on-ramp and Nimble Hill Road off-ramp (Weave LOS E).

#7 Spaulding Turnpike southbound weave between Nimble Hill Road and Exit 4N (Weave LOS E).

Geometric Deficiencies

Horizontal layout deficiencies exist in this area. The northbound exit has a 100-foot radius that is substandard for a 20 mph travel speed. This is a safety concern especially since there is heavy truck traffic on River Road due to the industrial plants and other businesses. Traffic control at this location is not clearly defined since the off-ramp and the opposing extension of River Road both operate without stop-sign control.

This exit is also used for a one way north-to-south change in direction on the Spaulding Turnpike via an underpass beneath the Spaulding Turnpike. This short extension of River Road joins the Turnpike again approximately 200 feet north of the Nimble Hill Road exit on the southbound side. There is a dangerous weave condition due to a combination of factors: grade, volumes, speed, and proximity of on and off ramps. Traffic entering from the extension of River Road can conflict with Turnpike traffic that is exiting onto Nimble Hill Road or into the adjacent Exxon service station. The deceleration length for the turn lane onto Nimble Hill Road is substandard due to the tight radius at the intersection and subsequent low turning speeds. Additionally, vehicles have been observed entering the Spaulding Turnpike from Nimble Hill Road at a very low speed (approximately 10-15 mph) having to accelerate to 55 mph in a matter of seconds, while either merging with high speed southbound traffic, or weaving across the Turnpike to reverse direction at Exit 4N or exit left onto Woodbury Avenue.

Little Bay Bridge Deficiencies

Area Description

The Little Bay Bridges carry the Spaulding Turnpike across Little Bay between the Town of Newington and the City of Dover. Each bridge consists of a two-lane cross section (2 lanes in each direction without shoulders) and was designed with a vertical crest curve in both the northbound and southbound directions. The bridges carried approximately 3,390 vph northbound and 2,500 vph southbound in the 1996 weekday PM peak hour. Traffic volumes are projected to increase to 6,720 vph northbound and 3,830 vph southbound by the year 2025.

Accidents

According to the accident reports, the Little Bay Bridges experience the highest number of accidents within the study area. The average number of accidents was found to be 22 accidents per year with 30 accidents occurring in 1993 (Figure 4, #3). Further investigation shows that approximately 30% of the accidents that were classified involved striking a fixed object on the bridge, 10% of the accidents involved a rear end collision, and 2% were angle collisions. Approximately 58% of the accidents were not classified by accident type. Eighty percent (80%) of the accidents occurred during the weekday with 39 of 112 of the accidents involving slick (rain/ice) conditions.

Although there is adequate vertical sight distance due to the long vertical curves and the gradual grade change, the profile itself may contribute to the cause of some accidents. Peak hour congestion results in LOS F freeway (free-flow) operations characterized by slow downs and occasional stopping along the bridge. Most of the accidents occurred in the evening during periods of congestion. Contributing factors include the lack of shoulders, abrupt lane changes by drivers to minimize delay and inclement weather. Some drivers ignore pavement markings and signage which prohibit lane changes.

Capacity Deficiencies

Capacity deficiencies exist along the Little Bay Bridge. Under existing conditions, the freeway operations in the northbound direction are LOS F. Additionally, under the 2025 traffic volume projections, the southbound direction is projected to operate at LOS E.

Geometric Deficiencies

Both bridges lack adequate shoulder areas.

Exit 5 and Surrounding Area Deficiencies

Area Description

The eastern half of Hilton Park and a number of private residences on Wentworth Terrace are accessed by way of Exit 5. The park attracts many people because it provides a number of playgrounds, fishing areas, and two boat ramps. This exit is configured as right-in / right-out access from the northbound barrel of the Spaulding Turnpike. In addition, traffic bound for destinations to the north utilizes this northbound entrance to the turnpike from the developments on the west side of the Spaulding Turnpike (Boston Harbor/Old Boston Road) via a one-way turnaround under the Little Bay Bridges at the north bank of the channel.

The Spaulding Turnpike is a four-lane (two-lanes in each direction with 6' inside and 10' outside paved shoulders) median divided roadway in the vicinity of Exit 5 with a posted speed limit of 50 mph and carries approximately 4,090 vph northbound and 2,500 vph southbound (1996 weekday PM peak hour volumes).). Approximately 10 vph exited and 170 vph entered the turnpike via Exit 5. The traffic volumes are projected to increase to 6,830 vph northbound, 3,830 vph southbound, 30 vph exiting and 140 vph entering the Turnpike via Exit 5 by 2025.

Accidents

The Exit 5 interchange has averaged three accidents per year. Other roadways and primary intersections within the Exit 5 analysis area have experienced on average three or fewer accidents per year.

Capacity Deficiencies

Capacity deficiencies exist along the following roadway segments and study area intersections within the Exit 5 area under 1996 traffic volumes as depicted in Figure 8:

#10 Northbound Spaulding Turnpike Exit 5 off-ramp junction (Ramp Junction LOS F).
#10 Northbound Spaulding Turnpike Exit 5 on-ramp junction (Ramp Junction LOS F).

#11 Northbound Spaulding Turnpike segment from Exit 5 to Exit 6 (Freeway LOS F).

Geometric Deficiencies

The off-ramp has a sharp curve with a radius of only 75 feet (Figure 6, #10). There have been accidents with and without boat trailers due to the short 400-foot deceleration lane in approach of the curve that is rated below 20 mph. The on-ramp from this exit has an adequate 600-foot acceleration lane before merging with traffic from the Spaulding Turnpike. In addition, the one-way connector under the Turnpike (Figure 8, #9) that links Hilton Park limits circulation in a one-way (west to east) direction between Hilton Park on the east side of the Turnpike and Boston Harbor Road located on the west side.

Exit 6 and Surrounding Area Deficiencies

Area Description

Dover Point Road accesses the Spaulding Turnpike at Exit 6N. In addition, the Cote Street residential area has access to the Spaulding Turnpike from its own dedicated on-ramp several hundred feet south of Exit 6N.

The Spaulding Turnpike is a four-lane (two-lanes in each direction with 6' inside and 10' outside paved shoulders) median divided roadway in the vicinity of Exit 6 with a posted speed limit of 50 mph and carries approximately 1,970 vph northbound and 1,230 vph southbound (1996 weekday PM peak hour volumes).). Additionally, approximately 920 vph exited the Turnpike at Exit 6N, 1,220 vph exited the Turnpike at Exit 6W northbound, 30 vph exited the Turnpike from Exit 6W southbound, 20 vph entered the Turnpike from the Cote Street on-ramp and 1,300 vph entered the Turnpike via the Exit 6 on-ramp from US Route 4, Dover Point Road, and Boston Harbor Road. Traffic volumes are projected to increase to 3,760 vph northbound and 2,190 vph southbound on the Spaulding Turnpike by 2025. Approximately 1,440 vph are projected to exit the Turnpike at Exit 6N, 1,670 vph are projected to exit the Turnpike at Exit 6W northbound, 70 vph are projected to exit the Turnpike from Exit 6W southbound, 40 vph are projected to enter the Turnpike from the Cote Street on-ramp and 1,710 vph are projected to enter the Turnpike via the Exit 6 on-ramp.

US 4 departs the Spaulding Turnpike in a westbound direction from this exit (Exit 6W) and merges with traffic from Dover Point Road before it traverses west over the Spaulding Turnpike towards Concord, NH. The bridge over the Spaulding Turnpike is one-way westbound. Motorists wishing to access Dover Point Road eastbound from US 4 eastbound must enter the Turnpike southbound and travel south to reverse direction at Exit 4N or travel south on Boston Harbor Road, go under the Spaulding Turnpike, enter the Spaulding Turnpike via Exit 5, and exit the Spaulding Turnpike at Exit 6N.

Immediately to the north of Exit 6 is the Dover Toll Booth which constrains traffic along the Turnpike during peak traffic periods.

Accidents

Exit 6 has averaged 5 accidents per year over the most recent five years of available accident data (Figure 4, #1). The highest number of accidents (9) occurred in 1994. The accident reports do not specify exactly where the accidents occurred at the exit, but the following was reported:

- Seventy-seven percent (77%) of the accidents occurred during the weekday.

- Fifteen percent (15%) of the accidents occurred during adverse weather conditions (rain/snow/ice).

- Twenty-three percent (23%) of the types of accidents recorded involved a fixed object, 15% of the accidents were rear-end, and the remaining 62% of the accidents were not classified by type.

Capacity Deficiencies

Capacity deficiencies exist along the following roadway segments and study area intersections within the Exit 6 analysis area under 1996 traffic volumes as depicted in Figure 8:

#14 Eastbound and westbound US 4 (Arterial LOS E).
#15 Eastbound and westbound Dover Point Road (Arterial LOS E).
#16 Northbound Spaulding Turnpike segment from Exit 6N to Exit 6W (Freeway LOS E).
#13 Spaulding Turnpike northbound weave between the Cote Road on-ramp and the Exit 6N off-ramp (Weave LOS F).

Additionally, under the 2025 traffic volume projections, the following roadway segments and intersections are projected to be deficient as depicted in Figure 9:

#12 Dover Point Road/Boston Harbor Road signalized intersection (Signalized LOS F).
#13 Eastbound and westbound US 4 (Arterial degrades to LOS F).
#14 Northbound Spaulding Turnpike segment from Exit 6N to Exit 6W (Freeway LOS F).
#17 Northbound Spaulding Turnpike segment from Exit 6W to toll plaza (Freeway LOS E).

Geometric Deficiencies

The short on-ramp that provides access to the Spaulding Turnpike northbound from the residential area in and around Cote Street (Figure 8, #12) is located on the inside of a curve with an obstructed sight line due to overgrown vegetation. It is also located just south of the off-ramp for Exit 6N (Dover Point Road). This presents a dangerous weave situation (Figure 8, #13) with much of the exiting traffic hugging the right shoulder of the road while local traffic is entering onto the Turnpike in the northbound direction. Capacity analyses with LOS F weaving conditions verify this conclusion. The short distance between ramps results in a serious deficiency in the acceleration lane for this on-ramp.

Exit 6W carries heavy traffic volumes in one lane around the 300-foot radius curve designed for 30 mph. There is adequate deceleration distance provided on the

approach to the exit when there are light traffic volumes, but this location is known to form a queue of traffic during peak hours thus reducing the deceleration lane significantly. This extends slow moving traffic into the normal traffic lanes for the through traffic on the Spaulding Turnpike and interferes with northbound traffic exiting the Turnpike.

Summary

The operational and geometric deficiencies on the Spaulding Turnpike within the Newington and Dover study area result in existing and future concerns with respect to roadway capacity, local access, and motorist safety.

Figure 10 summarizes the weekday PM peak hour level of service analyses that reflect current and future peak hour traffic operating conditions. The analysis indicates that current traffic operating conditions are constrained, and that northbound traffic volumes are either at capacity, or exceed the capacity of the Turnpike from Exit 3 to Exit 6. It is noteworthy that had the weekday AM peak hour traffic condition been modeled and analyzed, similar capacity constrained and poor levels of services would also be expected in the Turnpike's southbound direction under current conditions. Under future 2025 traffic conditions, the entire study area Turnpike system fails in both northbound and southbound directions. Weekday PM peak hour traffic volumes exceed available capacity by approximately 71 percent.

In addition to the inadequate roadway segment and interchange capacity, other system deficiencies include:

- Substandard curvature along interchange ramps.
- Inadequate acceleration and deceleration lanes at interchanges.
- Inadequate weave lengths between access points.
- Inadequate sight distance.
- Inefficient traffic patterns.

The assessment of existing roadway geometrics in conjunction with its analysis of current and future traffic operations serve as a backdrop for identifying and evaluating both interim and long term infrastructure improvements.

Arterial LOS

Node		LOS		
From	To	1996	2010	2025
29	30	A	B	B
30	22	B	B	B
32	26	E	E	F
25	32	E	E	F
5	34	C	C	D
34	6	C	C	D
33	21	E	E	E
21	33	E	E	E
25	17	B	C	D
18	25	B	C	D
27	28	B	C	D
28	27	B	C	D

Freeway LOS

Node		LOS		
From	To	1996	2010	2025
1	2	B	B	C
2	3	B	B	C
3	4	D	E	E
4^	5^	C	C	D
5	6	D	D	E
6^	7^	D	E	E
7	8	D	E	E
8	9	C	C	D
9	10	C	C	D
10	11	D	F	F
11	12	D	F	F
12	13	E	F	F
13^	14^	E	F	F
14	16	E	F	F
15	16	F	F	F
16	17	F	F	F
17	18	F	F	F
18^	19^	F	F	F
19	20	E	F	F
20	1	C	D	E

Ramp Junction LOS

Node	LOS		
	1996	2010	2025
2	*	*	*
3	*	*	*
4	C	D	F
5	C	D	F
6	C	D	F
7	C	D	F
8	D	D	E
10	D	F	F
11	D	F	F
12	E	F	F
13	F	F	F
14	F	F	F
15	F	F	F
16	F	F	F
17	F	F	F
18	F	F	F
19	D	F	F
20	D	F	F
22	*	*	*
23	B	B	B
26	*	*	*

Signalized LOS

Node	LOS		
	1996	2010	2025
30	B	B	F
28	n/a	C	F

Unsignalized LOS

Node	LOS		
	1996	2010	2025
21	D	E	F
22	B	B	B
24	B	n/a	n/a
25	E	n/a	n/a
27	A	B	C
29	A	B	B

Weaving LOS

Node		LOS		
From	To	1996	2010	2025
4	5	D	E	E
6	7	D	E	E
13	14	E	F	F
16	19	F	F	F

^ LOS obtained from 'non-weaving' vehicle summary found in weaving analysis

* Cannot be analyzed since ramp originates from/begins dedicated travel lane

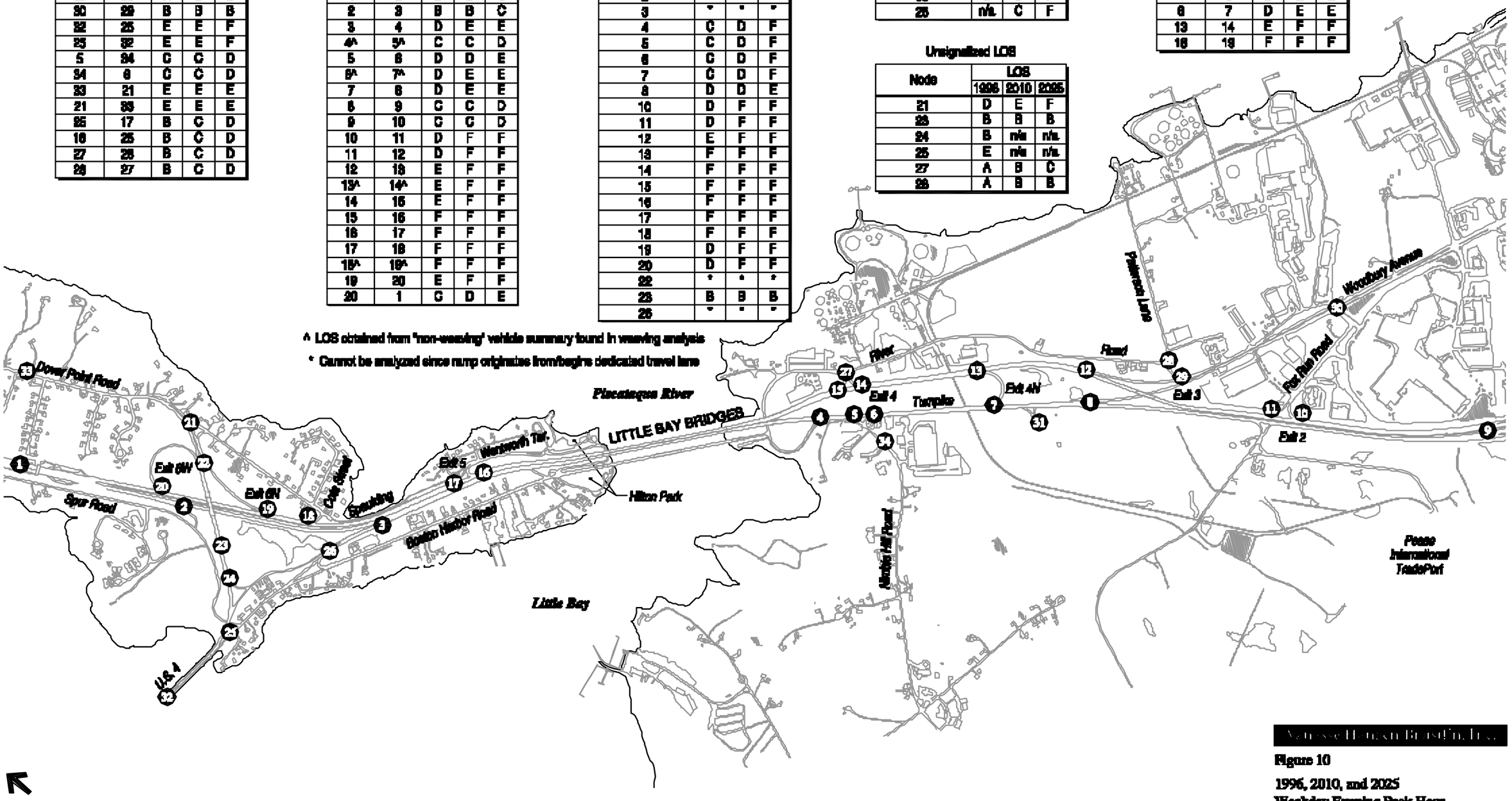


Figure 10

1996, 2010, and 2025
Weekday Evening Peak Hour
Level of Service Summary

3

Development of Alternatives

Conceptual transportation improvement alternatives were developed that address the safety, mobility and access deficiencies within the study area in Newington and Dover. These concepts were developed in an effort to maximize transportation efficiency while minimizing property and resource area impacts. The concepts were presented at public informational meetings in both communities, and at meetings with the Newington town officials, representatives of the New Hampshire Department of Transportation (NHDOT) and the Pease International Tradeport. Each alternative has its advantages and disadvantages, and it is recognized that additional variants of the concepts that are presented herein may be possible.

All of the reasonably viable Spaulding Turnpike transportation improvement alternatives that were developed are presented in this report. The following alternative descriptions accompany the fold-out figures that are based on larger scale conceptual drawings. The discussions of advantages and disadvantages for each alternative are included to highlight the primary differences among the alternatives. A matrix that graphically summarizes how the alternatives compare on the basis of approximately twelve characteristics is included at the end of this section. Some of the ratings in that matrix are subjective and are partly based on engineering judgement, knowledge of the project, and on feedback from the public, local officials and the NHDOT.

A common element of the development of long term conceptual improvement plans is the need to provide additional capacity in each direction across the Little Bay Bridges. Year 2025 travel demand projections, which reflect the impact of an area-wide travel demand management program, indicate that four lanes in each direction are warranted to accommodate both peak period through traffic and the impacts of vehicles at on and off-ramps which affect the distribution of traffic flow across all lanes as traffic maneuvers to avoid the turbulence of merge and diverge areas. In addition, emergency access for local public safety response to accidents and incidents along the Turnpike must also be considered as conceptual alternatives are refined and studied in greater detail.

Dover Improvement Alternatives

Two Spaulding Turnpike transportation improvement alternatives were developed within the Dover study area. The alternatives address capacity, safety and access deficiencies associated with Exits 5 and 6. The alternatives are described below and are illustrated in the enclosed conceptual plans.

Alternative 1 (Figure 11)

Description

This alternative converts Dover Point Road into a two-way roadway over the Turnpike all the way to the Scammel Bridge. (It is currently one-way in a westward direction over the Turnpike.) This concept is the more "free-flow" alternative, in comparison to Alternative 2, in that there is one fewer signalized intersection, better spacing between the system-to-system connections, and the Spaulding Turnpike NB to US 4 WB movement is still via a loop ramp. This allows for some improved capacity along the system in Dover.

The Turnpike itself is shown to be four lanes in each direction at the Little Bay Bridges (which would be widened to four lanes in each direction under all long range alternatives). The northbound Exit 6W would remain a loop ramp, but would be reconstructed along an improved alignment and widened to two lanes. A new northbound ramp from Dover Point Road would enter the Turnpike just south of the tolls.

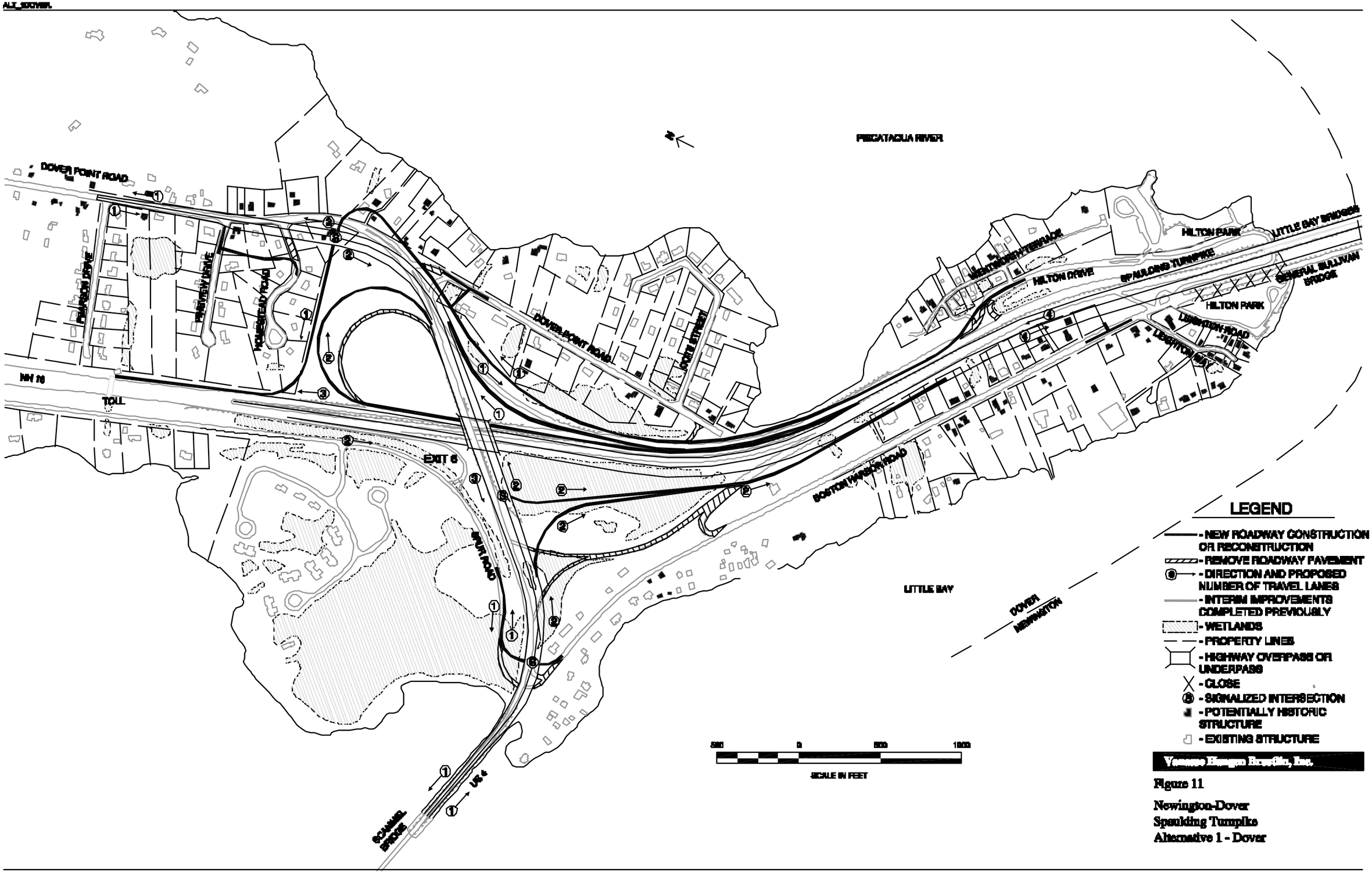
Exit 5 would be eliminated under this alternative. Northbound access to Hilton Park would be via a new Exit 6E that would connect to a new two-way local road that would extend all the way to Hilton Park. Pedestrian access between the eastern and western sides of the park would be maintained, but vehicle access to the eastern side of the park from the western side would be redirected via Dover Point Road. Vehicle access to the western side of Hilton Park would remain as it is today.

The US 4/Boston Harbor Road/Spur Road intersection would be relocated to the east to allow for additional eastbound storage lanes at the signals along US 4. Relocation of this intersection will permit the roadway to transition between the two lanes at the Scammel Bridge and the 5 lanes required at the signalized intersection.

Advantages

- The relatively more free-flow concept is operationally preferred over Alternative 2 which has multi-lane signalized intersections at the major system connections.
- This alternative provides a two-way local roadway connection to the eastern side of Hilton Park from Dover Point Road rather than raising the Turnpike for an east/west underpass, as in Alternative 2.

ALT_SDOVER.



Vanasse Hangen Brustlin, Inc.

Figure 11

Newington-Dover
Spaulding Turnpike
Alternative 1 - Dover

Disadvantages

- Two lane loop ramps are rather uncommon and have not been used before in New Hampshire except on a temporary basis.
- Property impacts in the vicinity of Dover Point Road would be greater than for Alternative 2.
- Requires an additional toll booth on northbound Exit 6 on-ramp (similar to Alternative 2).

Alternative 2 (Figure 12)

Description

This alternative widens the Turnpike as in Alternative 1. The main connections between US 4 / Dover Point Road and the Spaulding Turnpike would be handled in a modified diamond arrangement with major signalized intersections at the ramp termini. As in Alternative 1, Dover Point Road would be widened to allow two-way traffic over the Turnpike to US 4. Similar to Alternative 1, a new northbound ramp from Dover Point Road would enter the Turnpike just south of the tolls.

Advantages

- The amount of new ramp and roadway construction is less than in Alternative 1 resulting in less property impacts.

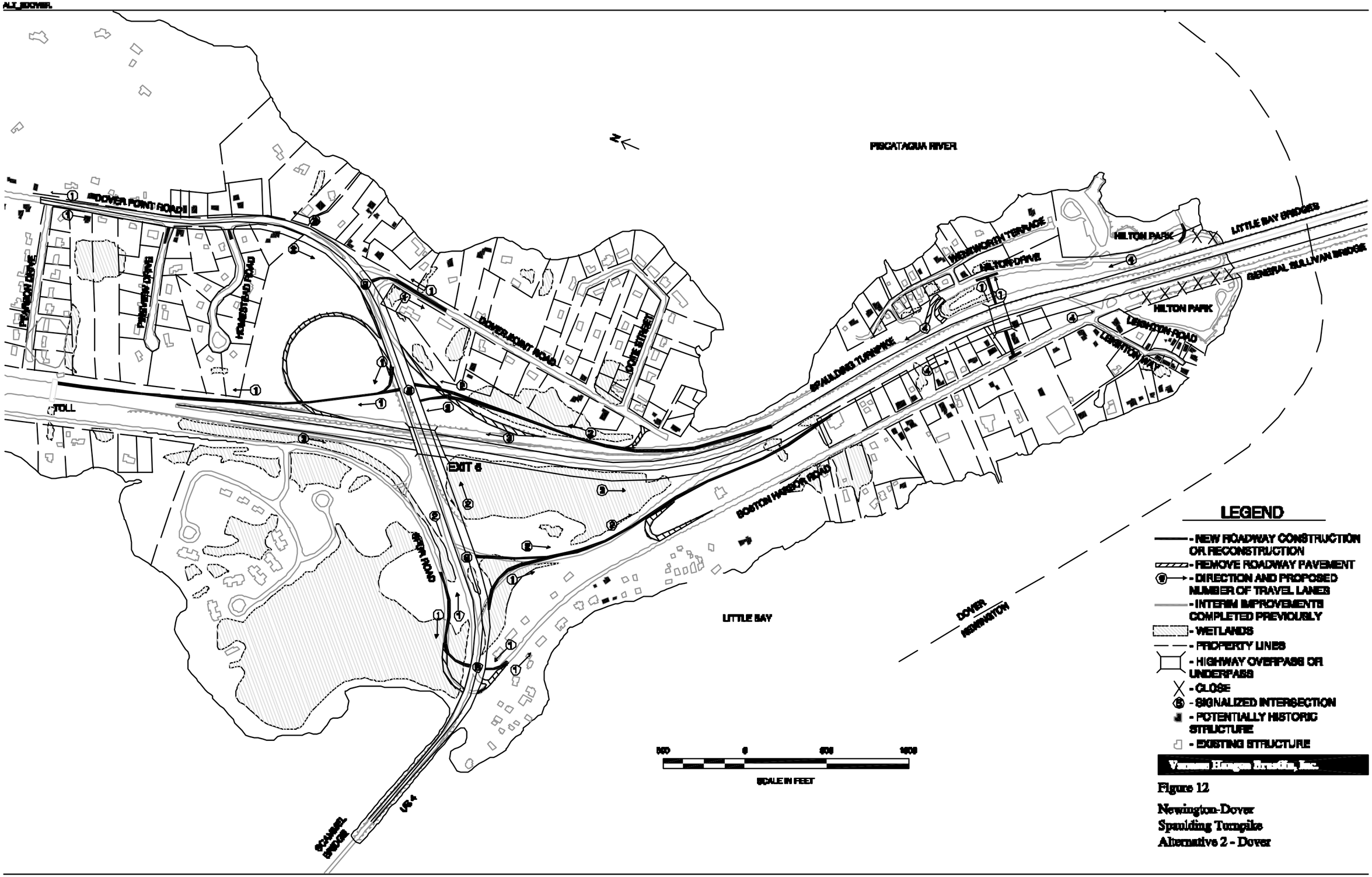
Disadvantages

- The east / west Hilton Park connector under the Turnpike will require that the Turnpike profile be raised significantly in that vicinity. This would require long and high retaining walls to minimize property impacts. The costs and aesthetic impacts of the profile change could be significant.
- Less efficient traffic flow in comparison to Alternative 1 due to the additional signal and the poorer spacing of signals.
- Requires an additional toll booth on northbound Exit 6 on-ramp.

Newington Improvement Alternatives

Multiple Spaulding Turnpike transportation improvement alternatives were developed to address the capacity, safety and access deficiencies within the portion of the study area that falls in the Town of Newington. In the process, a number of short-term improvements in Newington were identified that could be implemented within a relatively short time frame to address several of the more pressing safety deficiencies. The intent would be to implement these "interim" improvements in the near future while the "ultimate" or long range improvements are studied further, and then implemented in the future when funding is available. Two interim

ALT_SDOVER.



LEGEND

- NEW ROADWAY CONSTRUCTION OR RECONSTRUCTION
- REMOVE ROADWAY PAVEMENT
- DIRECTION AND PROPOSED NUMBER OF TRAVEL LANES
- INTERIM IMPROVEMENTS COMPLETED PREVIOUSLY
- WETLANDS
- PROPERTY LINES
- HIGHWAY OVERPASS OR UNDERPASS
- CLOSE
- SIGNALIZED INTERSECTION
- POTENTIALLY HISTORIC STRUCTURE
- EXISTING STRUCTURE

Vanasse Hangen Brustlin, Inc.

Figure 12

Newington-Dover
Spaulding Turnpike
Alternative 2 - Dover

solutions are described below, followed by seven ultimate Spaulding Turnpike improvement alternatives.

Newington Interim Improvement Alternatives

The following discussion describes and compares the two interim improvement alternatives in Newington that address existing safety deficiencies on the Spaulding Turnpike.

Alternative 1 (Figure 13)

Description

This interim improvement alternative closes the existing Exit 4N south-to-north reverse direction loop ramp in the wide Turnpike median. This ramp is the source of safety concerns on both sides of the Turnpike. On the southbound side it introduces a dangerously short weaving distance for vehicles wishing to head north from Nimble Hill Road. On the northbound side the short weaving distance occurs between the Exit 4N loop ramp and the Exit 4 off-ramp.

In order to provide the opportunity to reverse direction that will be lost by eliminating the Exit 4N ramp, the one-way ramp under the southern Little Bay Bridge approach (also known as Bloody Point Road) will be widened to allow two-way traffic between Nimble Hill Road and River Road. The two-way ramp will also be extended directly to Nimble Hill Road instead of entering the southbound side of the Turnpike as it does today. This will eliminate a weave between traffic entering the Turnpike to head southbound, and southbound traffic exiting the Turnpike onto Nimble Hill Road. This improvement will also provide much more direct access between the area of Newington west of the Turnpike and the area east of the Turnpike.

Another improvement that will be made under this alternative is the re-configuration of the northbound Exit 4 on and off-ramps to River Road. The existing deceleration and acceleration lanes are substandard, and the existing intersection that is formed between River Road and the ramps has vehicle storage and sight distance deficiencies. The proposed ramps will have greater acceleration and deceleration lengths, as well as improved vehicle storage capacity at the intersection that is formed at River Road. It is expected that River Road will also be widened to provide a left turn lane for traffic entering the northbound on-ramp.

INTERIM1

LEGEND

- NEW ROADWAY CONSTRUCTION OR RECONSTRUCTION
- REMOVE ROADWAY PAVEMENT
- DIRECTION AND PROPOSED NUMBER OF TRAVEL LANES
- INTERIM IMPROVEMENTS COMPLETED PREVIOUSLY
- WETLANDS
- PROPERTY LINES
- HIGHWAY OVERPASS OR UNDERPASS
- CLOSE
- SIGNALIZED INTERSECTION
- POTENTIALLY HISTORIC STRUCTURE
- EXISTING STRUCTURE

N

PISCATAQUA RIVER

PATTERSON LANE

POTENTIAL INDUSTRIAL CONNECTOR (BY OTHERS)

WOODBURY AVENUE

FOX RUN ROAD

BLOODY POINT

RIVER ROAD

SPAULDING TURNPIKE

EXIT 3

EXIT 2

LITTLE BAY BRIDGES

GENERAL SULLIVAN BRIDGE

EXIT 4

LITTLE BAY

NEWINGTON

PEASE INTERNATIONAL TRADEPORT

500 0 500 1000

SCALE IN FEET

Vanasse Hangen Brustlin, Inc.

Figure 13

Newington-Dover
Spaulding Turnpike
Interim Concept 1 - Newington

Advantages

- This interim improvement alternative eliminates the most serious of the existing safety deficiencies in the area. These improvements also appear to be feasible at a relatively modest cost and with minor property and resource area impacts.
- The Town supports this alternative, and is actively pursuing this layout with affected property owners in the process of redeveloping their property.

Alternative 2 (Figure 14)

Description

This improvement alternative incorporates all of the basic features of Alternative 1 above, plus it eliminates one more safety concern – the existing connection between Nimble Hill Road and the Turnpike. This would be accomplished by constructing a new set of ramps approximately 1,100 feet south of the current Nimble Hill Road access point. This improves the acceleration and deceleration distances at the Nimble Hill Road interchange. It also introduces the southbound traffic to the Turnpike at a point south of the Woodbury Avenue left lane exit (Exit 3). This eliminates the weave that currently exists from Nimble Hill Road to Woodbury Avenue. Motorists on Nimble Hill Road wishing to access Woodbury Avenue would do so via Gosling Road or via River Road and the planned Industrial Connector Road. It should also be noted, however, that the planned Industrial Road may not be implemented for many years due to funding and property impacts and is not intended to serve non-industrial related traffic.

Advantages

- This interim improvement alternative provides all of the benefits of Alternative 1, and eliminates the weave movement between Nimble Hill Road and Woodbury Avenue.

Disadvantages

- This alternative requires the creation of a new roadway off of Nimble Hill Road which would cross residential and commercial property, as well as wetlands. Given the Town's desire to construct the interim improvements in the near term, these obstacles may severely limit this alternative. Furthermore, the Town officials do not support the use of the residential land near the Town Center for the new roadway construction.
- From a traffic perspective, the elimination of the direct Nimble Hill Road to Woodbury Avenue access will make local connections to Woodbury Avenue circuitous and indirect at best.
- The implementation of this alternative would foreclose options that otherwise might be viable for the long term solution for the Spaulding Turnpike as it passes through Newington, or require that portions of this option be abandoned or completely reconstructed.

LEGEND

- NEW ROADWAY CONSTRUCTION OR RECONSTRUCTION
- REMOVE ROADWAY PAVEMENT
- DIRECTION AND PROPOSED NUMBER OF TRAVEL LANES
- INTERIM IMPROVEMENTS COMPLETED PREVIOUSLY
- WETLANDS
- PROPERTY LINES
- HIGHWAY OVERPASS OR UNDERPASS
- CLOSE
- SIGNALIZED INTERSECTION
- POTENTIALLY HISTORIC STRUCTURE
- EXISTING STRUCTURE

N

PISCATAQUA RIVER

PATTERSON LANE

POTENTIAL INDUSTRIAL CONNECTOR (BY OTHERS)

WOODBURY AVENUE

PEASE BOULEVARD

BLOODY POINT

RIVER ROAD

SPAULDING TURNPIKE

EXIT 3

EXIT 2

LITTLE BAY BRIDGES

GENERAL SULLIVAN BRIDGE

EXIT 4

LITTLE BAY

RUSSELL HILL ROAD

PEASE INTERNATIONAL TRADEPORT

500 0 500 1000

SCALE IN FEET

Vanasse Hangen Brustlin, Inc.

Figure 14

Newington-Dover
Spaulding Turnpike
Interim Concept 2 - Newington

Newington Ultimate Improvement Alternatives

The Newington transportation improvement alternatives that are presented in this report represent a variety of solutions for the same basic safety and operational deficiencies. There are many possible combinations of specific improvements that are possible within this complex study area. The following alternatives have undergone several rounds of State and local review, and the concepts evolved as priorities and evaluation criteria became better defined. The following seven alternatives represent the results of a chronological evolution of alternatives.

From discussions with Newington officials, a number of issues common to all of the full build, ultimate improvement alternatives emerged:

- The Town recognizes that the Turnpike is integral to the local and regional economy. The Turnpike needs to be widened for safety and capacity reasons, and direct and efficient interchanges providing full and ready access need to be constructed. The Town recommends that the Little Bay Bridges be widened to accommodate eight lanes.
- Relatively direct access to Pease International TradePort in the vicinity of Exit 2 or Exit 3 is desirable.
- Future adverse economic development impact to Newington should be minimized. Given the infrastructure available in Newington (available utilities, port, highways, airport, future trains), the long term, economic value of developable land is greater than just the current cost on the open market. From that perspective, the Town considers economic impacts due to loss of viable land to be at least as important as impacts to wetlands.
- Bicycle/pedestrian access across the Little Bay needs to be continued either via the existing General Sullivan Bridge, a new bridge on the General Sullivan Bridge site, or additional widening to the southbound Little Bay Bridge.
- Emergency access for town public safety response to accidents along the Turnpike must be considered.
- While future railroad access to the Pease International TradePort must be retained, the raising of the Turnpike profile and the resulting embankments to accommodate a railroad underpass at the current railroad crossing will create an unappealing visual condition.
- The Isaac Dow House is an important resource to the Town (and may be a historic resource). Nevertheless, given its proximity to Woodbury Avenue and the presence of the important and possibly historic property across the roadway, the Isaac Dow House may need to be relocated to accommodate improvements to Woodbury Avenue with all alternatives under consideration.

Alternative 1 (Figure 15)

Description

This alternative introduces a diamond interchange between the Turnpike and Woodbury Avenue. The northbound and southbound ramps to Woodbury Avenue terminate at signalized intersections. The northbound off-ramp would form a collector distributor road that would service an off-ramp at Exit 2 as well as the Woodbury Avenue interchange.

Woodbury Avenue would also be extended to the north as a two-way road connecting to the east end of Nimble Hill Road. This new roadway would be connected to River Road by a new east/west road under the Turnpike. This connector would be built parallel to the existing railroad track that the Turnpike would also span. The railroad track currently crosses the Turnpike at grade, but this crossing would be grade separated in the future under any of the improvement alternatives for possible future railroad re-activation. The proposed grade separation requires that the Turnpike profile be raised by approximately 27 feet where it passes over the track.

Advantages

- This alternative is relatively simple from the motorist's perspective since it centralizes the on- and off-ramps to one interchange.
- Provides relatively direct connection between Nimble Hill Road and River Road.

Disadvantages

- Less efficient traffic flow than currently exists for southbound motorists access to Woodbury Avenue.
- No access provided to the Pease International TradePort.
- Access to River Road and the Industrial Connector, and access between Nimble Hill Road and the southbound Turnpike are more circuitous than desirable.
- Requires raising the Turnpike profile to accommodate the railroad and the connection between Nimble Hill Road and River Road.

Alternative 2 (Figure 16)

Description

This alternative creates a single central interchange that connects directly to River Road and to a new extension of Woodbury Avenue which would run northerly and connect to Nimble Hill Road.

Similar to Alternative 1, there would be a connector roadway parallel to the railroad tracks that would connect the new Woodbury extension with River Road. The Turnpike would be elevated above the railroad track as described in Alternative 1.

The Exit 2 interchange would be maintained roughly as it is today.

ALT_1

LEGEND

- NEW ROADWAY CONSTRUCTION OR RECONSTRUCTION
- REMOVE ROADWAY PAVEMENT
- DIRECTION AND PROPOSED NUMBER OF TRAVEL LANES
- INTERIM IMPROVEMENTS COMPLETED PREVIOUSLY
- WETLANDS
- PROPERTY LINES
- HIGHWAY OVERPASS OR UNDERPASS
- CLOSE
- SIGNALIZED INTERSECTION
- POTENTIALLY HISTORIC STRUCTURE
- EXISTING STRUCTURE

N

PISCATAQUA RIVER

PATTERSON LANE

POTENTIAL INDUSTRIAL CONNECTOR (BY OTHERS)

RIVER ROAD

BLOODY POINT

WOODBURY AVENUE

SPAULDING TURNPIKE

FOX POINT ROAD

LITTLE BAY BRIDGES

EXIT 3

EXIT 2

GENERAL SULLIVAN BRIDGE

LITTLE BAY

NIMBLE HILL ROAD

PEASE INTERNATIONAL TRADEPORT

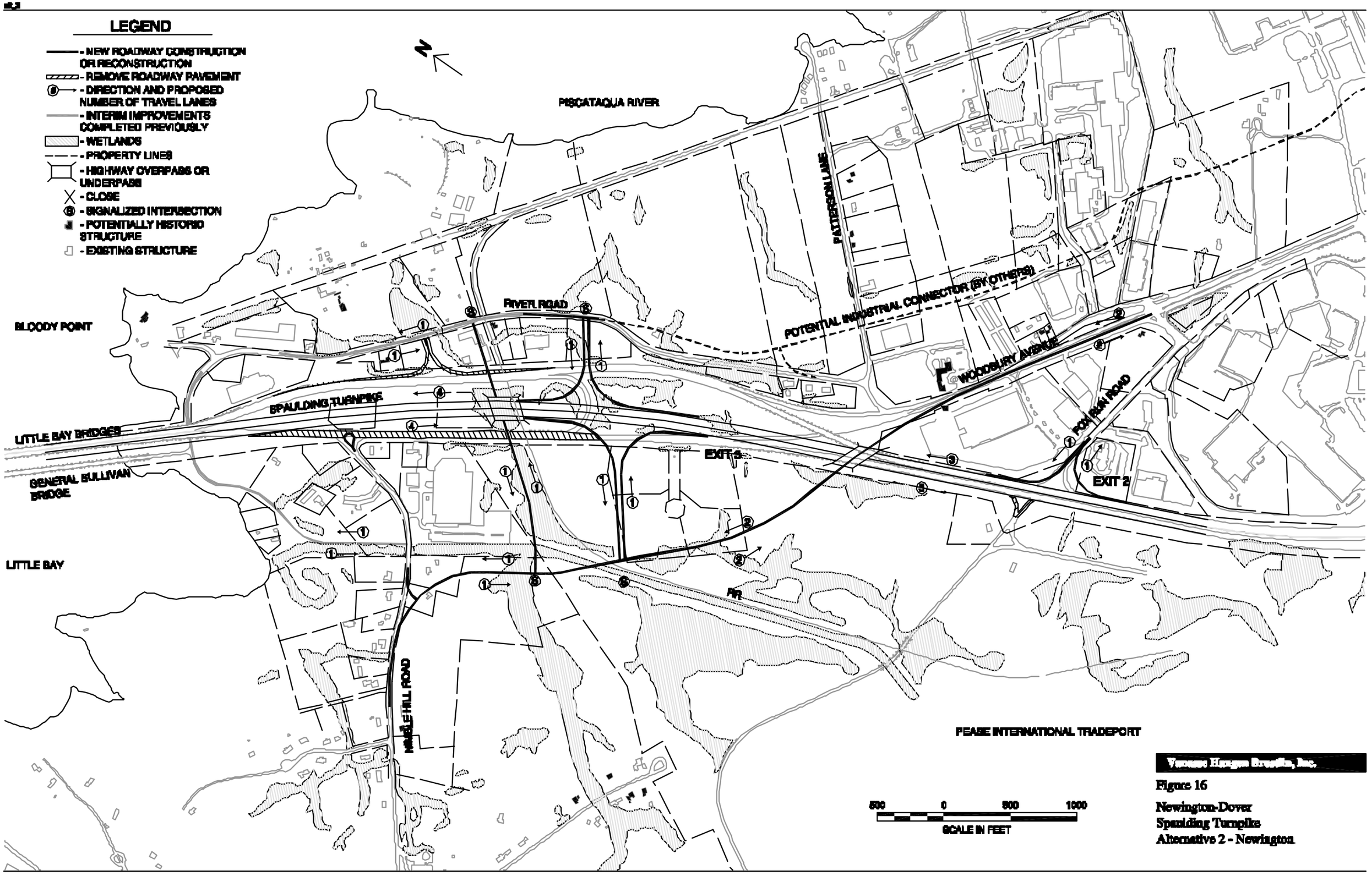
400 0 500 1000

SCALE IN FEET

Vanasse Hangen Brustlin, Inc.

Figure 15

Newington-Dover
Spaulding Turnpike
Alternative 1 - Newington



Vanasse Hangen Brustlin, Inc.

Figure 16

Newington-Dover
Spaulding Turnpike
Alternative 2 - Newington

Advantages

- This alternative is relatively simple from the motorist's perspective since it centralizes the on- and off-ramps to primarily one interchange.
- Exit 2 at Fox Run Road retains full northbound egress and access to the northbound side of the Turnpike, although access to some properties near the ramps may be changed.

Disadvantages

- Impacts residential property, and requires a relatively large footprint.
- Less efficient traffic flow than currently exists for southbound motorists accessing Woodbury Avenue.
- Poor access from Woodbury Avenue to northbound Turnpike.
- No access provided to the Pease International TradePort.
- Requires raising the Turnpike profile to accommodate the railroad and the connection between Nimble Hill Road and River Road.

Alternative 3 (Figure 17)

Description

This alternative is a "free-flow" concept in that it utilizes ramps that directly connect the Turnpike and Woodbury Avenue without the need for traffic signals. On the northbound side, there would be a long collector/distributor roadway that would service Exit 2N, Woodbury Avenue, and Exit 4.

Advantages

- From a transportation perspective this alternative would appear to function quite efficiently due to the lack of traffic signals, especially at the major system connections.

Disadvantages

- Impacts residential property and requires a relatively large footprint.
- The movement from Woodbury Avenue to the Turnpike southbound is circuitous and indirect.
- Access from the Turnpike northbound to the Newington Town Center is circuitous and indirect.
- No access provided to the Pease International TradePort.
- Requires raising the Turnpike profile to accommodate the railroad.
- Exit 4 northbound off-ramp departs Turnpike at its highest point resulting in a very steep ramp.
- Access from Fox Run Road to the Turnpike northbound would be discontinued.

ALT_3

LEGEND

- NEW ROADWAY CONSTRUCTION OR RECONSTRUCTION
- REMOVE ROADWAY PAVEMENT
- DIRECTION AND PROPOSED NUMBER OF TRAVEL LANES
- INTERIM IMPROVEMENTS COMPLETED PREVIOUSLY
- WETLANDS
- PROPERTY LINES
- HIGHWAY OVERPASS OR UNDERPASS
- CLOSE
- SIGNALIZED INTERSECTION
- POTENTIALLY HISTORIC STRUCTURE
- EXISTING STRUCTURE

N

PISCATAQUA RIVER

PATTERSON LANE

POTENTIAL INDUSTRIAL CONNECTOR (BY OTHERS)

RIVER ROAD

BLOODY POINT

COLLECTOR/DISTRIBUTOR

WOODBURY AVENUE

SPAULDING TURNPIKE

LITTLE BAY BRIDGES

EXIT 4

FOX RUN ROAD

EXIT 2

GENERAL SULLIVAN BRIDGE

LITTLE BAY

MAPLE HILL ROAD

PEASE INTERNATIONAL TRADEPORT

Vanasse Hangen Brustlin, Inc.

800 0 800 1600

SCALE IN FEET

Figure 17

Newington-Dover
Spaulding Turnpike
Alternative 3 - Newington

Alternative 4 (Figure 18)

Description

This alternative includes two interchanges, one at Woodbury Avenue (Exit 3), and one at Nimble Hill Road and River Road (Exit 4). As in the previous two alternatives, Woodbury Avenue would be extended to the north after passing over the Turnpike. Under this alternative, however, the Woodbury extension will then pass under the Turnpike near Exit 4 and connect to River Road. This alternative provides a northern entrance to the Pease International Tradeport by connecting the new Exit 3 interchange to the Pease roadway system. This would provide both northbound and southbound access to the Turnpike from Pease.

Advantages

- This alternative includes access to the Tradeport. The two-way Woodbury Connector makes use of the existing Turnpike right-of-way which minimizes the land use impacts in comparison to Alternatives 2 and 3. However, the southbound Exit 3 ramps and connector from Woodbury Avenue into the Pease International TradePort does impact the TradePort property.
- There is a ramp at Exit 3 that provides direct northbound access to the proposed Industrial Connector Road.

Disadvantages

- Less efficient traffic flow than currently exists for southbound motorists accessing Woodbury Avenue. With that said, the movement involves right-hand turns as opposed to left-hand turns proposed with Alternatives 1 and 2.
- Access between Fox Run Road and the Turnpike northbound would be discontinued.
- Requires raising the Turnpike profile to accommodate the railroad and the extension of Woodbury Avenue to River Road.

Alternative 5 (Figure 19)

Description

This alternative incorporates a two lane one-way collector distributor road from the southbound Little Bay Bridge (Exit 4) to Woodbury Avenue at Exit 3. Nimble Hill Road and a new connector road to the TradePort are served by this collector distributor road. On the northbound side there are on and off-ramps at Woodbury Avenue (Exit 3) as well as an on-ramp at Exit 4 which provides northbound access from River Road. An important component of the Exit 3 interchange is the creation of a short roadway from the interchange to the planned Industrial Connector Road.

Advantages

- This alternative includes partial access between the Pease International TradePort and the Turnpike.

ALT_4

LEGEND

- NEW ROADWAY CONSTRUCTION OR RECONSTRUCTION
- REMOVE ROADWAY PAVEMENT
- DIRECTION AND PROPOSED NUMBER OF TRAVEL LANES
- INTERIM IMPROVEMENTS COMPLETED PREVIOUSLY
- WETLANDS
- PROPERTY LINES
- HIGHWAY OVERPASS OR UNDERPASS
- CLOSE
- SIGNALIZED INTERSECTION
- POTENTIALLY HISTORIC STRUCTURE
- EXISTING STRUCTURE

PISCATAQUA RIVER

PATTERSON LANE

POTENTIAL INDUSTRIAL CONNECTOR (BY OTHERS)

BLOODY POINT

RIVER ROAD

SPAULDING TURNPIKE

WOODBURY AVENUE

LITTLE BAY BRIDGES

EXIT 4

EXIT 3

FOX RUN ROAD

GENERAL SULLIVAN BRIDGE

LITTLE BAY

NEWMARKET ROAD

PEASE INTERNATIONAL TRADEPORT

SCALE IN FEET

Vanasse Hangen Brustlin, Inc.

Figure 18

Newington-Dover
Spaulding Turnpike
Alternative 4 - Newington

ALT_5

LEGEND

- NEW ROADWAY CONSTRUCTION OR RECONSTRUCTION
- REMOVE ROADWAY PAVEMENT
- DIRECTION AND PROPOSED NUMBER OF TRAVEL LANES
- INTERIM IMPROVEMENTS COMPLETED PREVIOUSLY
- WETLANDS
- PROPERTY LINES
- HIGHWAY OVERPASS OR UNDERPASS
- CLOSE
- SIGNALIZED INTERSECTION
- POTENTIALLY HISTORIC STRUCTURE
- EXISTING STRUCTURE

N

PISCATAQUA RIVER

PATTERSON LANE

POTENTIAL INDUSTRIAL CONNECTOR (BY OTHERS)

BLOODY POINT

RIVER ROAD

SPAULDING TURNPIKE

EXIT 6

WOODBURY AVENUE

FOX RUN ROAD

EXIT 4

LITTLE BAY BRIDGES

GENERAL SULLIVAN BRIDGE

LITTLE BAY

NEWLE HILL ROAD

PEASE INTERNATIONAL TRADEPORT

Vanasse Hangen Brustlin, Inc.

Figure 19

Newington-Dover
Spaulding Turnpike
Alternative 5 - Newington

500 0 500 1000

SCALE IN FEET

- The new roadway connection to the Industrial Connector Road opposite the NB Exit 3 off-ramp will allow a direct connection for commercial vehicles and trucks that wish to enter the eastern industrial zone from the northbound side of the Turnpike.
- The southbound two lane collector distributor road that extends from Exit 4 to Exit 3 provides efficient access to Woodbury Avenue from the Turnpike, Nimble Hill Road, and the TradePort.
- Less land use impact than Alternatives 2, 3, and 4.

Disadvantages

- This alternative does not provide a convenient connection for vehicles that wish to head north on the Turnpike from Pease.
- This alternative does not provide a convenient connection for vehicles that wish to head south on the Turnpike from River Road or the Industrial Connector Road.
- The southbound one-way collector distributor road does not permit return access to Nimble Hill Road from Woodbury Avenue. Motorists would be required to use a portion of the Industrial Connector Road and River Road to get back to Nimble Hill Road.
- Less efficient traffic flow than currently exists for southbound motorists accessing Woodbury Avenue. With that said, the movement does not require left or right turns, and consequently is more efficient than Alternatives 1, 2, and 4.
- Access between Fox Run Road the Turnpike northbound would be discontinued.
- Requires raising the Turnpike profile to accommodate the railroad.

Alternative 6 (Figure 20)

Description

This alternative provides simple on / off ramps at Exit 4 to Nimble Hill Road and River Road. At Exit 3 there will be a southbound off ramp and northbound on and off ramps that will provide access to Woodbury Avenue and the northern end of the Tradeport. A southbound on-ramp is not provided since it would be too close to the Gosling Road exit.

This alternative relocates the railroad track to the south, as shown on the plan, which allows the Turnpike profile to remain low in the vicinity of Nimble Hill road.

Advantages

- The relocation of the railroad track addresses the Town's concern over the aesthetic impact of having a grade separated crossing of the existing track.
- The new Exit 4 interchange would be simple, uniform, and appropriate for the lower volumes expected at this interchange for the Town center and the north end of River Road.
- Partial access to the Tradeport is provided.

ALT_6

LEGEND

- NEW ROADWAY CONSTRUCTION OR RECONSTRUCTION
- REMOVE ROADWAY PAVEMENT
- DIRECTION AND PROPOSED NUMBER OF TRAVEL LANES
- INTERIM IMPROVEMENTS COMPLETED PREVIOUSLY
- WETLANDS
- PROPERTY LINES
- HIGHWAY OVERPASS OR UNDERPASS
- CLOSE
- SIGNALIZED INTERSECTION
- POTENTIALLY HISTORIC STRUCTURE
- EXISTING STRUCTURE

N

PISCATAQUA RIVER

PORTSMOUTH

BLOODY POINT

RIVER ROAD

POTENTIAL INDUSTRIAL CONNECTOR (BY OTHERS)

WOODBURY AVENUE

FOX RUN ROAD

EXIT 4

SPAULDING TURNPIKE

LITTLE BAY BRIDGES

GENERAL SULLIVAN BRIDGE

RELOCATED NH

EXIT 3

LITTLE BAY

NIMBLE HILL ROAD

PEASE INTERNATIONAL TRADEPORT

500 0 500 1000

SCALE IN FEET

Vanasse Hangen Brustlin, Inc.

Figure 20

Newington-Dover
Spaulding Turnpike
Alternative 6 - Newington

Disadvantages

- The total separation of Exits 3 and 4 results in the need to use the Turnpike for some local traffic circulation. For example, it is necessary to enter the Turnpike at Exit 4 southbound and leave the Turnpike at Exit 3 in order to get from Nimble Hill Road to Woodbury Avenue.
- There is no southbound entrance to the Turnpike at the new Exit 3 interchange. This means that from the TradePort and from Woodbury Avenue there is no direct southbound access point.
- Circuitous routing of industrial related traffic due to poor access between River Road and the Turnpike northbound.
- Relocation of railroad impacts residential area on Patterson Lane.
- Access between Fox Run Road and the Turnpike northbound would be eliminated.
- Less efficient traffic flow than currently exists for southbound motorists accessing Woodbury Avenue. With that said, the movement does not require left or right turns, and consequently is more efficient than Alternatives 1, 2, and 4.

Alternative 7 (Figure 21)

Description

This alternative creates a "single point" interchange midway between the existing Exits 3 and 4. The northbound and southbound on and off-ramps converge on a single signalized intersection beneath the Turnpike mainline which will be raised to span the intersection. This type of interchange handles high traffic volumes in a relatively compact footprint. A connector road will extend from River Road, pass through the Turnpike interchange, intersect the connection between Woodbury Avenue and Nimble Hill Road, and proceed south into the TradePort.

This alternative requires that the railroad track be relocated to the south to make room for the centralized interchange.

Advantages

- This alternative consolidates the two existing interchanges into one interchange and simplifies the transportation network while providing relatively efficient access.
- The free-flow ramps between the Turnpike and Woodbury Avenue lend greatly to the efficiency of the plan.
- Commercial traffic from River Road and the proposed Industrial Connector is consolidated at one convenient access point to the Turnpike.
- Full access is provided to the TradePort.
- Land impacts less than Alternatives 1, 2 and 3, and only slightly more than Alternatives 5 and 6.

ALT 7

LEGEND

- NEW ROADWAY CONSTRUCTION OR RECONSTRUCTION
- REMOVE ROADWAY PAVEMENT
- (P) → - DIRECTION AND PROPOSED NUMBER OF TRAVEL LANES
- INTERIM IMPROVEMENTS COMPLETED PREVIOUSLY
- WETLANDS
- PROPERTY LINES
- HIGHWAY OVERPASS OR UNDERPASS
- CLOSE
- (S) - SIGNALIZED INTERSECTION
- POTENTIALLY HISTORIC STRUCTURE
- EXISTING STRUCTURE

N

PISCATAQUA RIVER

PATTERSON LANE

POTENTIAL INDUSTRIAL CONNECTOR (BY OTHERS)

WOODBURY AVENUE

RIVER ROAD

BLOODY POINT

SPAULDING TURNPIKE

EXIT 4

FOX RUN ROAD

LITTLE BAY BRIDGES

GENERAL SULLIVAN BRIDGE

RELOCATED NH

LITTLE BAY

PEASE INTERNATIONAL TRADEPORT

500 0 500 1000

SCALE IN FEET

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Figure 21

Newington-Dover
Spaulding Turnpike
Alternative 7 - Newington

Disadvantages

- This alternative would likely be the most expensive to construct since it involves relocation of the railroad, construction of eight bridge structures, and construction of a considerable amount of roadway and ramps.
- Requires raising the Turnpike profile to accommodate the interchange layout. The raise in profile will be similar to that required for the grade separated railroad crossing proposed for Alternatives 1, 2, 3, 4, and 5.
- Access between Fox Run Road and the Turnpike northbound is discontinued.
- Relocation of railroad impacts residential area on Patterson Lane.

Summary of Alternatives

Table 2 summarizes the characteristics of each alternative. With respect to the Interim Alternatives in Newington, Alternative 1 is superior to Alternative 2 on several accounts – the Town prefers it, it is simpler (one interchange versus two), it affects 50 percent less commercially-zoned property, it has fewer wetland crossings and it costs approximately $1.6 million (42 percent) dollars less to build.

None of the Ultimate or long term improvement alternatives stand out – each alternative has several shortcomings. Alternative 1 in Dover is more free flowing and enjoys more local support than Alternative 2; Alternative 2, however, has less residential property impacts and is slightly ($1.9 million) less costly to build. In Newington, Alternative 7 is simpler, consolidates local traffic at a single interchange, maximizes the number of local traffic connections, involves relocating the railroad access to the TradePort, avoids residential property impacts, and is strongly supported by Town officials. It is the most costly alternative ($57.7 million) to construct, however, and requires the crossing of 11 wetlands.

SUMMARY OF IMPROVEMENT ALTERNATIVE CHARACTERISTICS

	Transportation Improvement Alternatives										
	Dover		Newington								
	Ultimate		Interim		Ultimate						
Characteristic — Concept No:	1	2	1	2	1	2	3	4	5	6	7
Level of Community Support — Measure of relative acceptance by community. (1 being best)	1	2	1	2	4	6	6	4	3	2	1
Transportation System Efficiency : — Ease of access and lack of congestion.											
Number of Interchanges — (see plans)	1	1	1	2	1	1.5	1.5	2	2	2	1
Number of Traffic Signals — (see plans)	3	4	0	0	2	4	1	5	2	2	3
Number of Movements Served Well — Out of 22 possible connections (Newington Only).	N/A	N/A	N/A	N/A	17	16	10	13	14	14	21
Land Use Impacts :											
No. of Commercial Parcels Impacted	5	5	3	6	4	6	6	5	5	5	5
No. of Residential Parcels Impacted	27	22	1	1	0	3	3	2	0	0	0
Wetland Impacts (# of crossings)	8	7	5	8	9	12	9	9	5	11	11
Relocates Railroad Track	N/A	N/A	No	No	No	No	No	No	No	Yes	Yes
Order of Magnitude Costs ($ Millions) — (Incl. 1/2 of Little Bay Bridge Costs in Dover & 1/2 in Newington)	42.0	40.1	2.2	3.8	39.0	45.6	48.2	49.6	42.8	44.0	57.7
Impacts to Potentially Historic Properties — Number or Structures Apparently Impacted.	8	8	0	0	1	1	1	1	1	1	1

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Table 2
Summary of Improvement Alternative Characteristics

4

Findings and Recommendations

Review of available traffic accident data and roadway geometry, analysis of existing traffic operating conditions, coupled with field observations and discussion with local officials and residents revealed a number of safety and traffic operational deficiencies. Such deficiencies include: high accident locations, substandard geometry at interchange ramps, inadequate merge, diverge and weaving distances between interchanges, inconvenient and inefficient traffic flow patterns, and system wide capacity constraints resulting in weekday peak period congestion and forced flow traffic volume conditions.

Interim Improvements

Of the two interim conceptual improvement alternatives developed to address the existing study area safety and traffic operational deficiencies located in Newington, Alternative 1 (Figure 13) is recommended for implementation. As previously described, these improvements eliminate dangerous traffic weaving conditions by closing the Exit 4N median turnaround and providing a two-way connection between Nimble Hill Road (on the west side of the Turnpike) and River Road (on the east side of the Turnpike) via Bloody Point Road under the Turnpike, just south of the Little Bay bridges. The northbound Exit 4 River Road on-and-off ramps will also be reconstructed and relocated to the south to provide safer access and egress to the Turnpike through improved geometry, longer acceleration and deceleration lanes, and an improved ramp intersection with River Road. These recommendations address the most serious study area safety deficiencies, while maintaining an efficient local traffic circulation pattern. The planned improvements appear to be implementable at relatively modest cost ($2.2 million) and with relatively minor environmental and property impacts. The Town of Newington supports the plan and is actively pursuing project participation and support from affected property owners who are in the process of planning the redevelopment of their property. Implementation of these improvements will not preclude development of the longer term improvement plan.

Long Term Improvements

Year 2025 travel demand projections indicate that, in conjunction with local and regional travel demand management (TDM) activities, the traffic capacity of the Little Bay bridges needs to be doubled (four lanes in each direction) to avoid a total Turnpike system failure with respect to the flow and operations of through traffic and local traffic that enters and exits the Turnpike at each interchange. It is apparent from the development and evaluation of improvement concepts for both Dover and Newington that no single alternative is without one or more shortcomings as one attempts to balance the benefits of improved transportation efficiency and public safety with project costs and impacts to properties and the natural and cultural environment. As such, all nine (9) long term improvement concepts are recommended at this time to be considered further as part of the more detailed environmental studies process anticipated prior to selecting an alternative for eventual construction.

It should be noted that of the two Dover alternatives, Dover residents and officials preferred Alternative 1 (Figure 11) due primarily to its free flow movements for major traffic connections. Of the Newington alternatives, Town officials and residents expressed consensus of support for Alternative 7 (Figure 21). This concept is appealing for several reasons: it consolidates Turnpike access for local residents, industry and the Pease International TradePort at a central interchange, it provides free flow connections between the Turnpike and Woodbury Avenue, and it has potentially less property and visual impacts than most of the other alternatives.